United States
Department of
Agriculture

Natural
Resources
Conservation
Service

In cooperation with Iowa Agriculture and Home Economics Experiment Station; Cooperative Extension Service, Iowa State University; and Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship

Soil Survey of Monona County, Iowa

Part I

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How To Use This Soil Survey

This survey is divided into three parts. Part I includes general information about the survey area; descriptions of the general soil map units, detailed soil map units, and soil series in the area; and a description of how the soils formed. Part II describes the use and management of the soils and the major soil properties. This part may be updated as further information about soil management becomes available. Part III includes the maps.

On the **general soil map**, the survey area is divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map units in the area on the color-coded map legend, then refer to the section **General Soil Map Units** in Part I of this survey for a general description of the soils in your area.

The **detailed soil maps** can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**. Note the number of the map sheet, and turn to that sheet.

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Contents** or the **Numerical Index to Map Units** in Part I of this survey, which lists the map units and shows the page where each map unit is described.

The **Contents** in Part II shows which table has data on a specific land use for each detailed soil map unit. Also, see the **Contents** in Part I and Part II for other sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1994. Soil names and descriptions were approved in 1996. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1994. This survey was made cooperatively by the Natural Resources Conservation Service; the Iowa Agriculture and Home Economics Experiment Station; the Cooperative Extension Service, Iowa State University; and the Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship. The survey is part of the technical assistance furnished to the Monona County Soil and Water Conservation District. Funds appropriated by Monona County were used to defray part of the cost of the survey.

Cover: An area of Hamburg and Napier soils in Monona County. In the background are soils on bottom land along the Missouri River.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service homepage on the World Wide Web. The address is http://www.nrcs.usda.gov.

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Issued 2002

Numerical Index to Map Units

Foreword

This soil survey contains information that can be used in land-planning programs in Monona County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described, and information on specific uses is given. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Leroy Brown
State Conservationist
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Soil Survey of
Monona County, Iowa

By Bennie Clark, Jr., Natural Resources Conservation Service

Fieldwork by Bennie Clark, Jr., Wayne N. Dankert, Joseph A. Falkenberg, Scott Larson, and Patrick T. Cowsert, Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with
the Iowa Agriculture and Home Economics Experiment Station; the Cooperative Extension Service, Iowa State University; and the Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; and the kinds of crops and native plants. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind or segment of the landscape. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landscape, soil scientists develop a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientists to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Individual soils on the landscape commonly merge into one another as their characteristics gradually change. To construct an accurate map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, soil reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

This soil survey updates an earlier survey of Monona County published in 1959 (White, 1959). It provides additional information and has larger maps, which show the soils in greater detail.

The State and county boundaries shown on the maps in this publication are approximate along the Missouri River and along the borders where the county lines are not on the roads. The boundary shown between Iowa and Nebraska was plotted from a base map compiled by the U.S. Army Corps of Engineers, dated January 30, 1940. This boundary was established as the State line by the Iowa-Nebraska Boundary Compact of 1943.

The descriptions, names, and delineations of the soils in this survey area do not fully agree with those of the soils in adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey areas.

General Nature of the County

Monona County is in west-central Iowa (fig. 1). It has an area of 447,300 acres, or about 698 square miles. It is bounded on the west by the Missouri River, on the east by Crawford County, on the north by Woodbury County, and on the south by Harrison County. Onawa is the county seat.

History

The first historical report of the area that is now Monona County was made by the Lewis and Clark expedition in 1804, 48 years before the first Europeans settled in the area. Lewis and Clark stopped along the Missouri River at what is now Blue Lake. The native people in the area at the time were the Oto, Omaha, Missouri, and Sioux.

Monona County was established in 1851 by an act of the Iowa General Assembly, but the county had no permanent residents until 1852. County boundaries were fixed in 1865.

By 1865, the population of the county had grown from 3 to 202. Over the next 30 years, the population grew to 12,147. The county’s population peaked at 18,238 in 1940.

The first European settler in Monona County is believed to be Aaron Cook, who spent the winter of 1851 in the area. The first permanent settler was Isaac Newton. In 1852, Newton lived 2 miles north of the present site of Onawa. In 1855, he established the town of Ashton.

Early enterprises in the county included trapping, hunting, and trading with the Indians. As settlement of the area increased, agriculture quickly became the major occupation in the county.

The first railway came to Monona County in 1867. By about 1887, three railways were operating in the county. The railroad greatly improved transportation and access to markets and thus affected the settlement and development of the entire county.

Resources, Transportation Facilities, and Recreation

The most valuable natural resources in Monona County are the soils on agricultural lands. Bottom land in the Missouri River Valley is generally ideal for the production of row crops. Areas in the uplands that are not too sloping are well suited to row crops, forage, and pasture.

Sand and gravel are in many parts of the county. These resources typically occur in association with major streams and rivers.

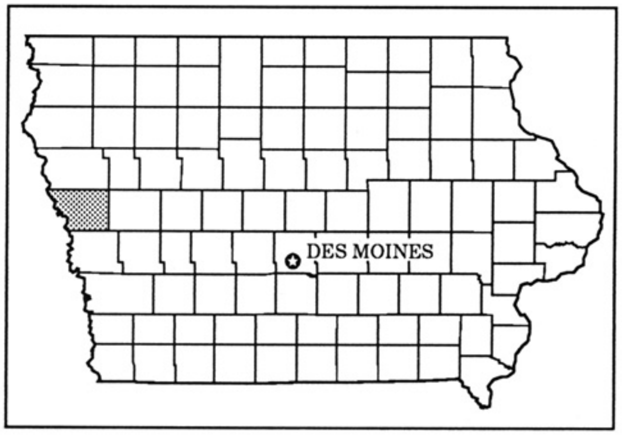

Figure 1.—Location of Monona County in Iowa.

Wildlife is plentiful in Monona County. Deer, pheasant, turkey, quail, and small furbearers are common because of good habitat and an adequate food supply. Fish are common in the rivers, ditches, and impoundments throughout the county. Ground water for irrigation is plentiful in areas of bottom land along the Missouri River, and it is used to great advantage in the seed production industry.

A good farm-to-market road system exists throughout the county. Federal, State, and county highways provide good access to all parts of the county. Interstate 29 runs north and south just west of Blencoe, Onawa, and Whiting. State Highway 175 runs east and west through Onawa and Mapleton. State Highway 37 runs east and west from Turin through Soldier and on to Dunlap. State Highway 183 runs north and south from Ute through Soldier and Moorhead and on to Pisgah. State Highway 141 runs east and west from Ute through Mapleton and on to Smithland. Paved county roads and gravel roads provide additional transportation routes.

Railroad service is available in Whiting, Onawa, and Blencoe. Truck service is available to all communities. Bus service is available in Onawa. Small aircraft are served at Onawa and Mapleton. The closest commercial flights are in Sioux City and Omaha. The county itself has no barge facilities on the Missouri River, but barge traffic serves points to the north and south.

State and county parks provide facilities for camping, fishing, boating, hunting, picnicking, hiking, and sightseeing. Many of the towns in the county have well furnished city parks.

Lewis and Clark State Park provides boating, fishing, swimming, camping, and picnic opportunities. Preparation Canyon State Park provides camping, hiking, and picnic facilities.

The Loess Hills State Wildlife Area offers hiking and hunting areas and a scenic view of the Missouri River flood plain from atop the loess bluffs. The Loess Hills Scenic Byway is a system of scenic routes through the beautiful and unique loess hills of Monona County.

Cropland

In 1994, about 325,878 acres in Monona County was used for crops and about 121,422 acres was pasture, was enrolled in a government set-aside program, or was used for other purposes. About 183,874 acres was used for corn; 129,351 acres for soybeans; 3,631 acres for oats; 720 acres for wheat; and 8,302 acres for alfalfa and other hay. The acreage used for corn and soybeans has increased in recent years, and the acreage used for hay and pasture has decreased.

The soils in Monona County have good potential for sustained, efficient crop production provided they are managed according to their properties and capabilities. The information in this soil survey can be used to apply the crop production technology necessary for sustained, efficient crop production.

Water erosion is the major management concern in areas used for cropland. Water erosion is a hazard where the slope is more than about 2 percent. It becomes progressively more severe with increasing slope. Sheet and rill erosion is the most common type of water erosion in the county, but gully erosion also occurs in some areas.

Most gully erosion occurs in the more sloping areas of the Monona-Ida-Napier and Ida-Castana-Hamburg associations, which are described under the heading “General Soil Map Units.” Accelerated runoff from the adjacent, less sloping cultivated soils on ridgetops increases the rate of gully erosion on the more sloping soils on side slopes in these associations.

Water erosion reduces the efficiency of crop production. Research indicates that yields are reduced by topsoil losses and that additional fertilizers can only partially compensate for lost topsoil. Fertilizers and other soil-applied chemicals are lost along with topsoil when soils erode.

The amount of soil loss is sometimes underestimated because tillage typically maintains the thickness of the surface layer by incorporating material from the subsurface layer or subsoil. When this material is incorporated into the surface layer, the content of organic matter and the level of fertility are reduced. The reduced content of organic matter in the

surface layer increases the hazard of erosion. Research has shown that uneroded areas of Monona soils are much less erodible than soils that have similar textures but contain less organic matter (Meyer and Harmon, 1984).

Landscape position can also affect the erodibility of the soils (Johnson, 1988). For example, Monona soils on the upper side slopes and on some convex ridgetops are more susceptible to erosion than Monona soils that are on the lower side slopes.

Erosion can be controlled by cultural practices, erosion-control structures, or both. Cultural practices include farming on the contour and applying a system of conservation tillage that maintains a protective cover of residue on at least 30 percent of the surface. Erosion-control structures, such as terraces and sediment-control basins, can reduce the effective slope length.

Conservation tillage systems have both short-term and long-term benefits. Increasing the amount of crop residue on the soil surface reduces the runoff rate and the hazard of erosion in sloping areas. Most conservation tillage systems also require less total tillage than other systems. Over a long period, soils that have received less tillage have a higher content of organic matter and a higher level of nitrogen than other soils, even where there is no difference in degree of erosion (Lamb and others, 1985). Other changes in the physical and chemical properties of the soils are associated with conservation tillage. Most of these changes improve soil productivity or reduce production costs. In some soils under certain conditions, more soil nitrogen is lost through leaching and as gaseous nitrous oxide under a no-till system than under a conventional tillage system. In general, the most effective conservation tillage systems are those that leave the largest amount of crop residue on the soil surface.

About 79,500 acres of cropland in Monona County is irrigated. Most of the irrigation is in areas of the Albaton-Onawa-Forney and Luton-Salix associations, which are described under the heading “General Soil Map Units.”

Center-pivot irrigation is the most common system of water application in the county. A few farmers use gated pipe for furrow irrigation. In most irrigated areas, the cropland is leveled or shaped before the irrigation system is established. This practice improves surface drainage. If the land is not leveled, irrigation can increase ponding and hamper soil aeration in poorly drained and very poorly drained areas of the Albaton-Onawa-Forney and Luton-Salix associations. Irrigated crop yields tend to be higher in areas where fill material has been placed than in areas where the soil material has been removed for leveling or land shaping. This difference is most noticeable in areas of the Albaton-Onawa-Forney association and in areas of Luton soils in the Luton-Salix association where the remaining topsoil of the cut area is less than about 12 inches thick.

The main irrigated crops are corn, soybeans, and seed corn. Irrigated potatoes are grown in a few areas. Soil blowing is a management concern in irrigated areas. Minimizing fall tillage and establishing more field shelterbelts reduce the hazard of soil blowing.

Most of the irrigation wells remove water from the alluvial aquifer that underlies the predominantly clayey and silty surficial material. Most of the water from this aquifer has a high content of iron, but the iron content is not harmful to the irrigated crops commonly grown. In places, irrigation water could also be removed from the deeper Dakota Sandstone aquifer, but installation of wells in these areas would be more expensive than installation in the shallower alluvial aquifer.

Tile drainage improves soil aeration and effective rooting depth in some areas of poorly drained soils, such as Colo and Zook soils. Tile drainage is not effective in clayey soils on bottom land, such as Albaton and Luton soils. Leveling the land or shaping the fields so that they drain into shallow surface drains minimizes ponding and improves aeration of the clayey soils on bottom land. Additional information about drainage and assistance in designing artificial drainage systems are available at the local office of the Natural Resources Conservation Service.

Physiography, Drainage, and Geology

The Missouri River Valley in Monona County consists of three distinct geomorphic regions. These are the bar area, young bottom land, and old bottom land (fig. 2).

The ***bar area*** is the area adjacent to the Missouri River (fig. 3). It is nearly continuous from north to south in Monona County. It includes the area thought to have been occupied by the Missouri River within about the last 100 years. This area was frequently flooded with 8 to 10 feet of water before the construction of dams on the Missouri River.

The Army Corps of Engineers built dams upstream on the Missouri River in South Dakota and North Dakota to control downstream flooding. These dams were completed in 1955. Since that time the only remaining frequently flooded areas are chutes, low swales, and other low areas adjacent to the Missouri River. Because of the dams, the flooding frequency of the soils in the bar area is now rated as ***occasional***.

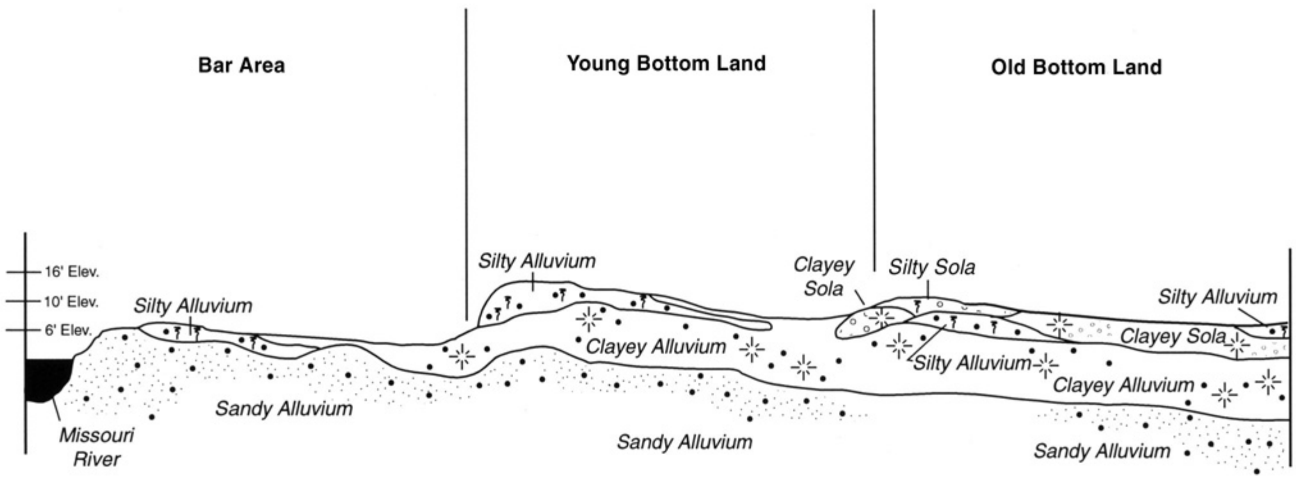

Figure 2.—An overview of the relationship between parent materials and position on the Missouri River flood plain.

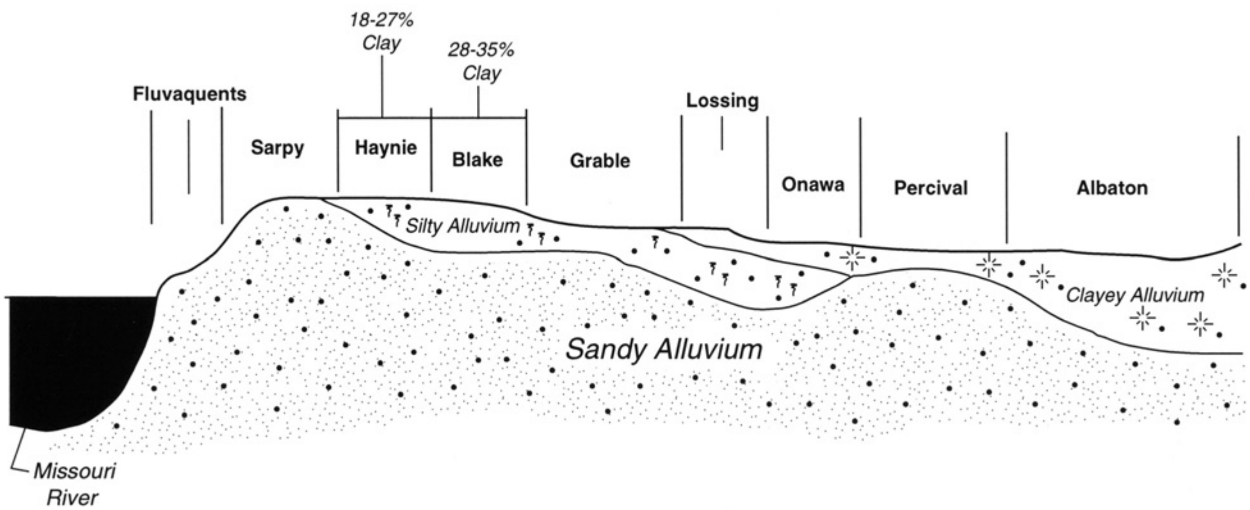

Figure 3.—The relationship of the major soils to parent material and position in the bar area of the Missouri River flood plain.

There are no farmsteads in the bar area, but a few vacation cabins have been built in recent years. Some of the soils in this area are the occasionally flooded phases of Albaton and Percival soils.

The ***young bottom land*** is the area between the bar area and the old bottom land (fig. 4). The Missouri River occupied channels in this area during the past 100 to 300 years. As the river meandered, meander loops and channels were abandoned. Some of the loops and channels were partly filled by deposition during later flooding. Most of the area in the young bottom land was covered with floodwater during the flood of 1952. Some areas of Haynie, Blake, and Modale soils were not flooded because they are at the higher elevations. Because of the dams on the Missouri River, the flooding frequency of the soils on the young bottom land is now rated ***rare***.

Many of the same soils are mapped both in the bar area and on the young bottom land. These soils are identified on the soil maps with different map unit symbols because of the difference in flooding frequency. Also, the soils on the young bottom land tend to be somewhat less stratified than the corresponding soils in the bar area.

The ***old bottom land*** is the area between the young bottom land and the loess hills in the uplands (fig. 5).

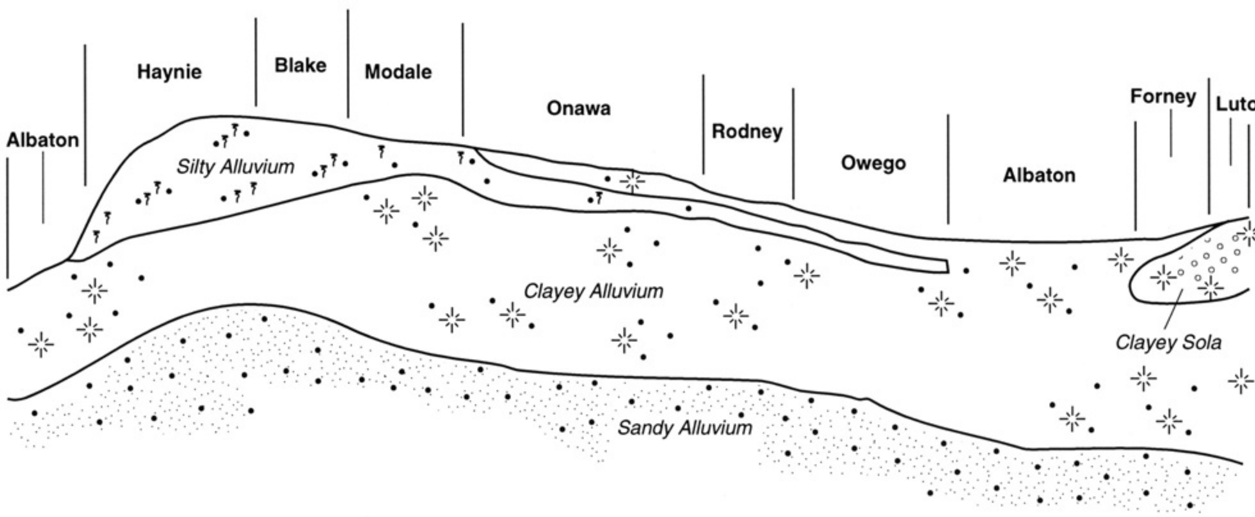

Figure 4.—The relationship of the major soils to parent material and position on the young bottom land of the Missouri River flood plain.

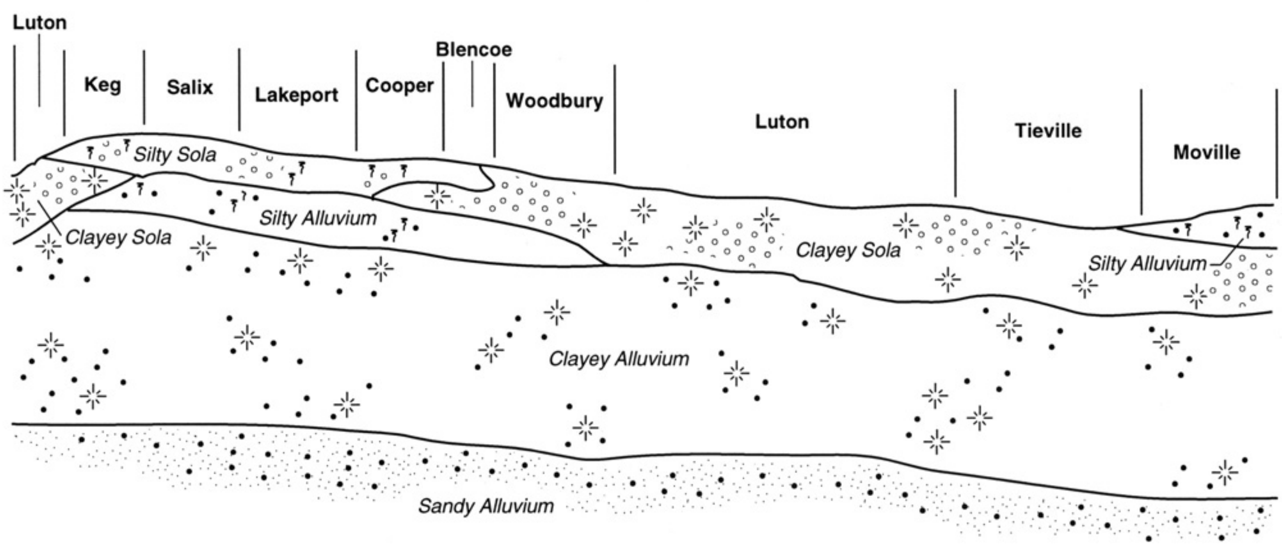

Figure 5.—The relationship of the major soils to parent material and position on the old bottom land of the Missouri River flood plain.

Because it does not have meander scars and oxbows left behind from the meandering Missouri River, the old bottom land has fewer surface features than the bar area and the young bottom land.

Most of the old bottom land is at a lower elevation than the young bottom land, but the old bottom land has been flooded less frequently than the young bottom land. At the conjunction of the young bottom land and the old bottom land, the young bottom land is cut deeper into the Missouri River Valley and leaves behind an area that acts as a natural levee that is higher in elevation than the remaining bottom-land areas in the Missouri River Valley. The rarely flooded Keg and Salix soils are typical of the soils on this natural levee. Because floodwaters have not crested this natural levee for hundreds or even thousands of

years, the soils are more developed than those on the young bottom land or in the bar area.

Flooding in areas of the old bottom land is mainly caused by flooded tributary rivers and streams.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Onawa, Iowa, in the period 1961 to 1990. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on the length of the growing season.

In winter, the average temperature is 22.9 degrees F and the average daily minimum temperature is 12.7 degrees. The lowest temperature on record, which occurred at Onawa on January 12, 1912, is -32 degrees. In summer, the average temperature is 73.7 degrees and the average daily maximum temperature is 85.5 degrees. The highest temperature, which occurred at Onawa on July 4, 1936, is 110 degrees.

Growing degree days are shown in table 1. They are equivalent to “heat units.” During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 29.38 inches. Of this, 18.65 inches, or about 63 percent, usually falls in May through September. The growing season for most crops falls within this period. The heaviest 1-day rainfall on record was 6.98 inches at Onawa on September 26, 1915. Thunderstorms occur on about 44 days each year, and most occur in June.

The average seasonal snowfall is 33.9 inches. The greatest snow depth at any one time was 37 inches recorded on February 21, 1936. On an average, 53 days per year have at least 1 inch of snow on the ground. The heaviest 1-day snowfall on record was 17.0 inches recorded on April 10, 1913.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 81 percent. The sun shines about 70 percent of the time possible in summer and 55 percent in winter. The prevailing wind is from the northwest. Average windspeed is highest, 13.2 miles per hour, in April.

Table 1.--Temperature and Precipitation

(Recorded in the period 1961-90 at Onawa, Iowa)

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	29.9	9.1	19.5	57	-22	0	0.59	0.17	0.93	1	7.3
February---	36.0	14.9	25.5	64	-18	0	.73	.25	1.13	1	7.0
March------	48.4	26.4	37.4	81	-3	28	2.17	.84	3.29	4	7.4
April------	64.3	38.8	51.5	90	17	147	2.75	1.41	3.92	6	1.4
May--------	74.8	50.2	62.5	94	28	396	4.10	2.57	5.49	7	.0
June-------	83.9	59.8	71.8	100	42	654	4.45	2.09	6.48	6	.0
July-------	87.8	64.5	76.1	101	48	810	3.69	1.89	5.26	5	.0
August-----	84.8	61.8	73.3	99	44	721	3.19	1.59	4.59	5	.0
September--	76.1	52.6	64.3	96	31	435	3.22	1.43	4.75	5	.0
October----	65.4	40.8	53.1	88	19	170	2.37	.73	3.70	4	.6
November---	48.1	27.7	37.9	72	2	16	1.22	.27	1.97	2	2.8
December---	33.1	14.1	23.6	61	-17	1	.89	.40	1.31	2	7.5
Yearly:											
Average---	61.0	38.4	49.7	---	---	---	---	---	---	---	---
Extreme---	---	---	---	102	-24	---	---	---	---	---	---
Total-----	---	---	---	---	---	3,378	29.38	22.66	34.78	48	33.9

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1961-90 at Onawa, Iowa)

Probability	Temperature: 24 °F or lower	Temperature: 28 °F or lower	Temperature: 32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 20	May 2	May 14
2 years in 10 later than--	Apr. 15	Apr. 27	May 9
5 years in 10 later than--	Apr. 6	Apr. 18	Apr. 29
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 10	Sept. 27	Sept. 22
2 years in 10 earlier than--	Oct. 16	Oct. 2	Sept. 27
5 years in 10 earlier than--	Oct. 26	Oct. 12	Oct. 5

Table 3.--Growing Season

(Recorded in the period 1961-90 at Onawa, Iowa)

Probability	Daily minimum temperature during growing season: Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	180	153	138
8 years in 10	188	161	145
5 years in 10	202	176	158
2 years in 10	217	191	172
1 year in 10	225	199	179

General Soil Map Units

The general soil map in this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils or miscellaneous areas can be identified on the map. Likewise, areas that are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

1. Albaton-Percival-Sarpy Association

Setting

Landform: Flood plains (bar area) (fig. 6)
Slope range: 0 to 5 percent

Composition

Percent of the survey area: 7
Extent of the components in the association:
Albaton soils—24 percent
Percival and similar soils—21 percent
Sarpy and similar soils—16 percent
Soils of minor extent—39 percent

Soil Properties and Qualities

Albaton

Drainage class: Poorly drained
Landform: Flood plains (bar area)
Slope range: 0 to 2 percent
Parent material: Clayey alluvium and silty over clayey alluvium

Percival

Drainage class: Somewhat poorly drained
Landform: Flood plains (bar area)
Slope range: 0 to 2 percent
Parent material: Clayey alluvium over sandy alluvium

Sarpy

Drainage class: Excessively drained
Landform: Flood plains (bar area)
Slope range: 0 to 5 percent
Parent material: Sandy alluvium

Minor Soils

- Onawa soils, which have a lower content of clay below a depth of 18 to 30 inches than the Albaton soils, a lower content of sand throughout than the Sarpy soils, and a lower content of sand below a depth of 15 to 30 inches than the Percival soils; on bottom land
- Grable soils, which have a lower content of clay than the Albaton and Percival soils and a lower content of sand above a depth of 18 to 30 inches than the Sarpy soils; on bottom land
- Haynie and Blake soils, which have a lower content of clay than the Albaton and Percival soils and a lower content of sand than the Sarpy soils; on bottom land

Major Uses

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

2. Albaton-Onawa-Forney Association

Setting

Landform: Flood plains (young bottom land) (fig. 6)
Slope range: 0 to 2 percent

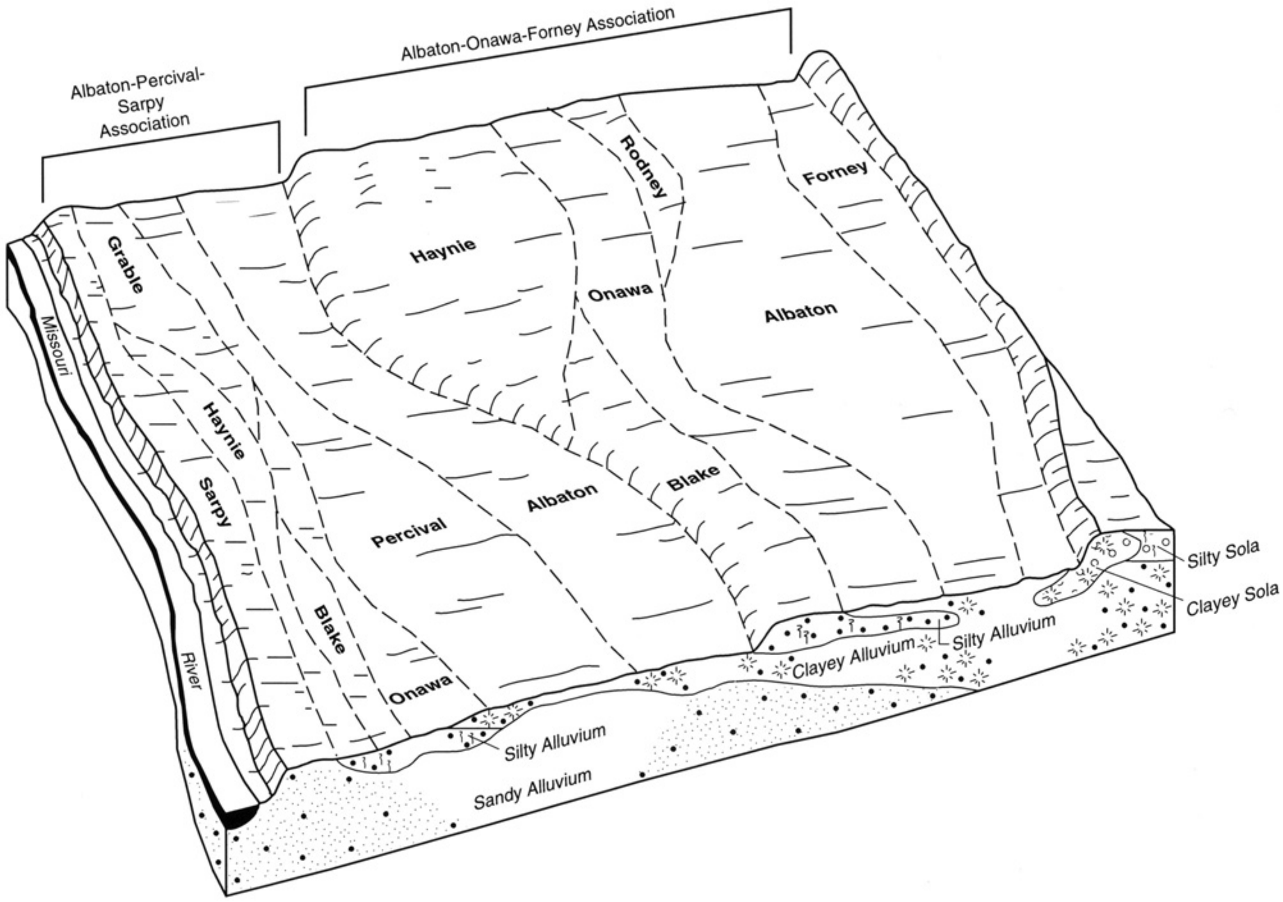

Figure 6.—Typical pattern of soils and parent material in the Albaton-Percival-Sarpy and Albaton-Onawa-Forney associations.

Composition

Percent of the survey area: 15
Extent of the components in the association:
Albaton soils—24 percent
Onawa and similar soils—20 percent
Forney soils—12 percent
Soils of minor extent—44 percent

Soil Properties and Qualities

Albaton

Drainage class: Poorly drained
Landform: Flood plains (young bottom land)
Slope range: 0 to 2 percent
Parent material: Clayey alluvium and silty over clayey alluvium

Onawa

Drainage class: Somewhat poorly drained
Landform: Flood plains (young bottom land)
Slope range: 0 to 2 percent
Parent material: Silty alluvium over clayey alluvium

Forney

Drainage class: Poorly drained
Landform: Flood plains (young bottom land)
Slope range: 0 to 2 percent
Parent material: Clayey alluvium

Minor Soils

- Haynie and Blake soils, which have a lower content of clay throughout than the Albaton and Forney soils and have less clay above a depth of 18 to 30 inches than the Forney soils
- Owego and Rodney soils, which have a lower content of clay in the lower part than the Albaton and Forney soils and have a thinner layer of silt loam in the lower part than the Onawa soils; in positions on the bottom land higher than those of the Albaton and Forney soils and lower than those of the Onawa soils

Major Uses

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

3. Luton-Salix Association

Setting

Landform: Flood plains (old bottom land) (fig. 7)
Slope range: 0 to 2 percent

Composition

Percent of the survey area: 24
Extent of the components in the association:
Luton soils—54 percent
Salix and similar soils—13 percent
Soils of minor extent—33 percent

Soil Properties and Qualities

Luton

Drainage class: Poorly drained
Landform: Flood plains (old bottom land)
Slope range: 0 to 1 percent
Parent material: Clayey alluvium

Salix

Drainage class: Moderately well drained
Landform: Flood plains (old bottom land)
Slope range: 0 to 2 percent
Parent material: Silty alluvium

Minor Soils

- Blencoe and Woodbury soils, which have less clay in the lower part of the subsoil than the Luton soils and more clay in the surface layer than the Salix soils

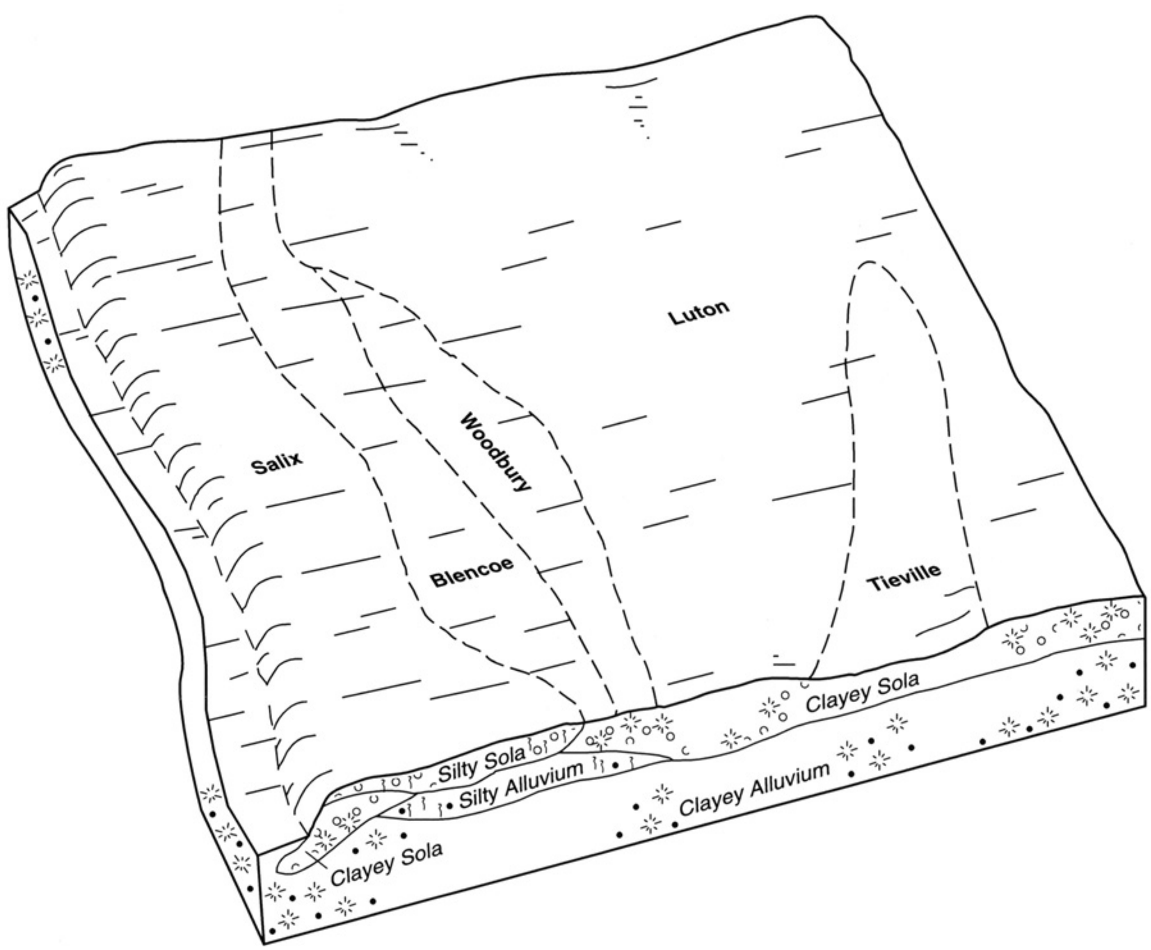

Figure 7.—Typical pattern of soils and parent material in the Luton-Salix association.

Major Uses

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section

4. Kennebec-Colo-McPaul Association

Setting

Landform: Flood plains (fig. 8)
Slope range: 0 to 2 percent

Composition

Percent of the survey area: 8
Extent of the components in the association:
Kennebec soils—22 percent
Colo soils—18 percent
McPaul soils—17 percent
Soils of minor extent—43 percent

Soil Properties and Qualities

Kennebec

Drainage class: Moderately well drained
Landform: Flood plains
Slope range: 0 to 2 percent
Parent material: Silty alluvium

Colo

Drainage class: Poorly drained
Landform: Flood plains
Slope range: 0 to 2 percent
Parent material: Silty alluvium

McPaul

Drainage class: Moderately well drained
Landform: Flood plains
Slope range: 0 to 2 percent
Parent material: Calcareous alluvium

Minor Soils

- Nodaway soils, which are lighter colored than the Colo and Kennebec soils and have lower pH than the McPaul soils

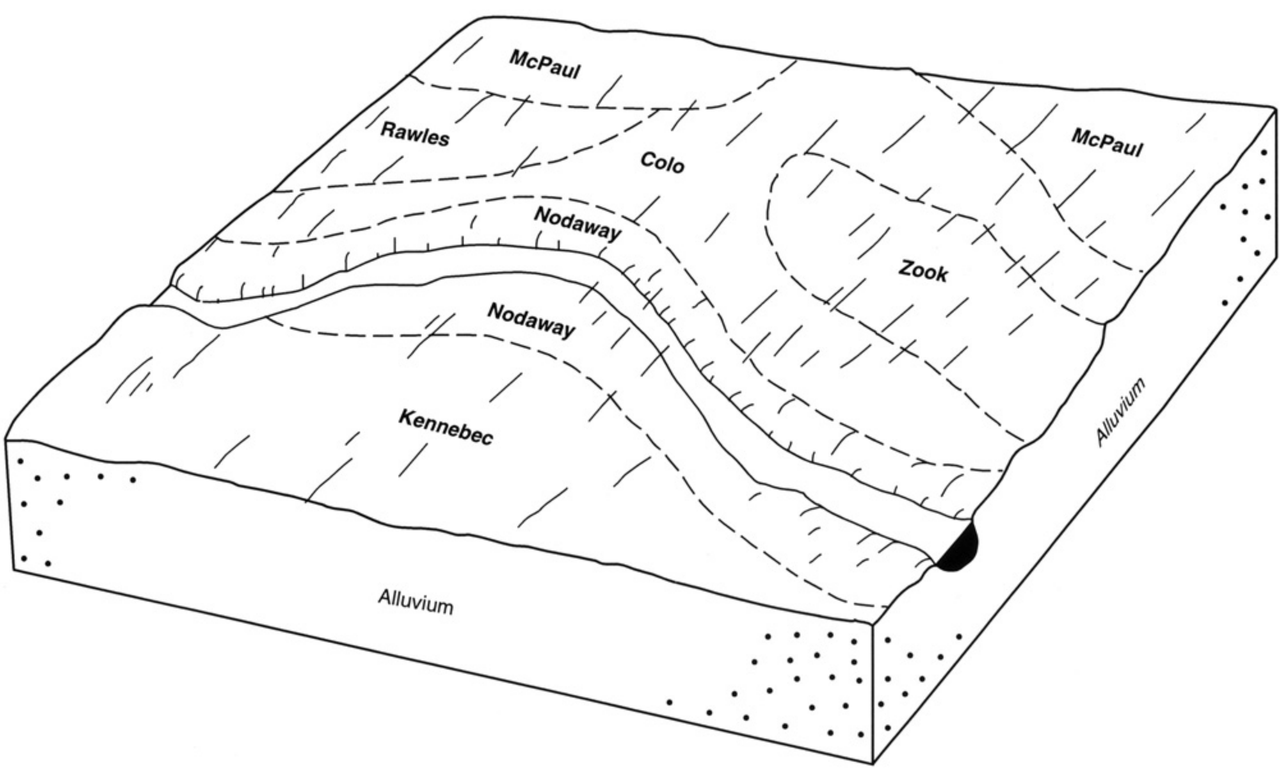

Figure 8.—Typical pattern of soils and parent material in the Kennebec-Colo-McPaul association.

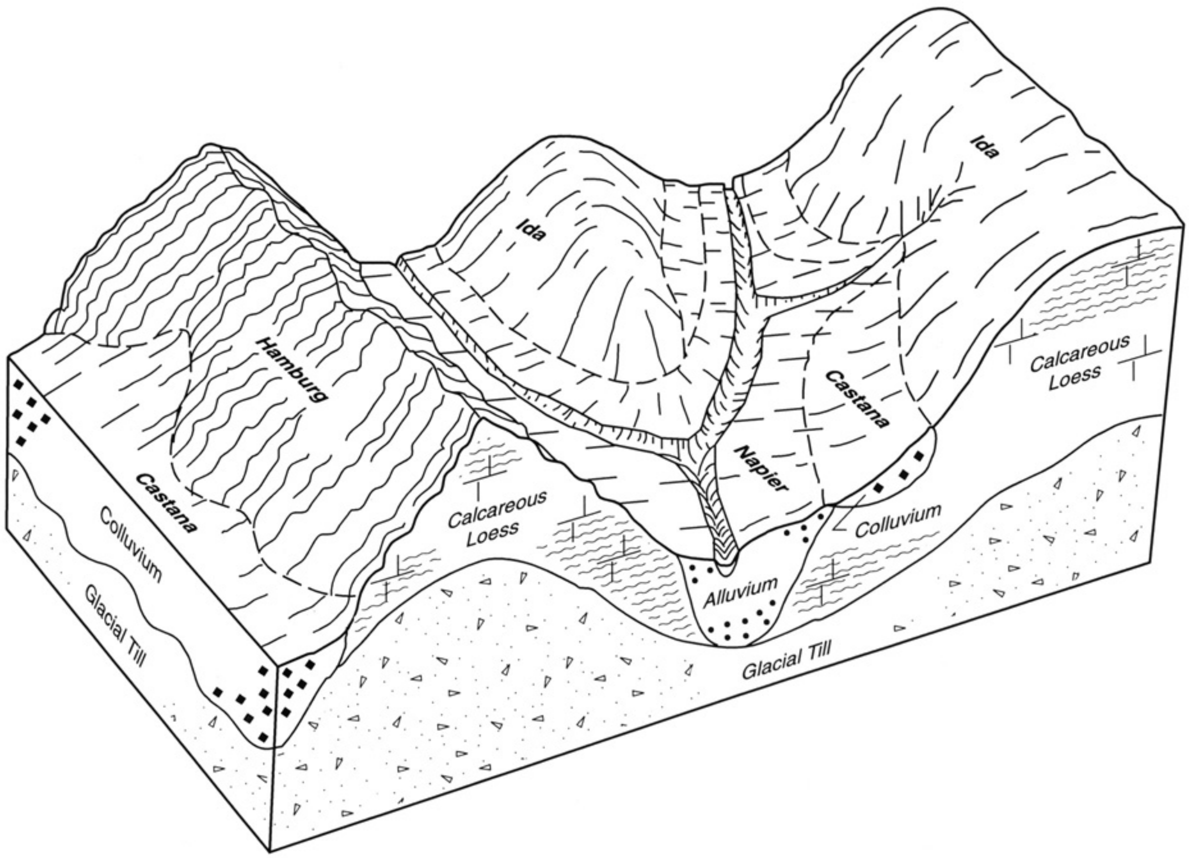

Figure 9.—Typical pattern of soils and parent material in the Ida-Castana-Hamburg association.

• Rawles soils, which are lighter colored in the upper part than the Colo and Kennebec soils and darker in the lower part than the McPaul soils
• Zook soils, which have a higher content of clay throughout than the major soils

Major Uses

- Cropland
- Hayland
- Pasture
- Woodland

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section
- “Forest Land” section

5. Ida-Castana-Hamburg Association

Setting

Landform: Uplands (fig. 9)
Slope range: 5 to 75 percent

Composition

Percent of the survey area: 7
Extent of the components in the association:
Ida soils—31 percent
Castana soils—24 percent
Hamburg soils—21 percent
Soils of minor extent—24 percent

Soil Properties and Qualities

Ida

Drainage class: Well drained
Landform: Uplands
Geomorphic component: Interfluves, head slopes, nose slopes, and side slopes
Hillslope position: Summits, shoulders, and backslopes
Slope range: 5 to 40 percent
Parent material: Calcareous loess

Castana

Drainage class: Well drained

Landform: Uplands
Geomorphic component: Base slopes
Hillslope position: Footslopes
Slope range: 9 to 30 percent
Parent material: Silty alluvium

Hamburg

Drainage class: Somewhat excessively drained
Landform: Uplands
Geomorphic component: Interfluves, head slopes, nose slopes, and side slopes
Hillslope position: Summits and backslopes
Slope range: 40 to 75 percent
Parent material: Calcareous loess

Minor Soils

• Napier soils, which are more acid in the upper part than the major soils and are darker to a greater depth; on footslopes and alluvial fans

Major Uses

- Cropland
- Hayland
- Pasture
- Woodland

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section
- “Forest Land” section

6. Monona-Ida-Napier Association

Setting

Landform: Uplands, upland drainageways, stream terraces, and alluvial fans (fig. 10)
Slope range: 0 to 40 percent

Composition

Percent of the survey area: 39
Extent of the components in the association:
Monona soils—37 percent
Ida soils—32 percent
Napier soils—28 percent
Soils of minor extent—3 percent

Soil Properties and Qualities

Monona

Drainage class: Well drained

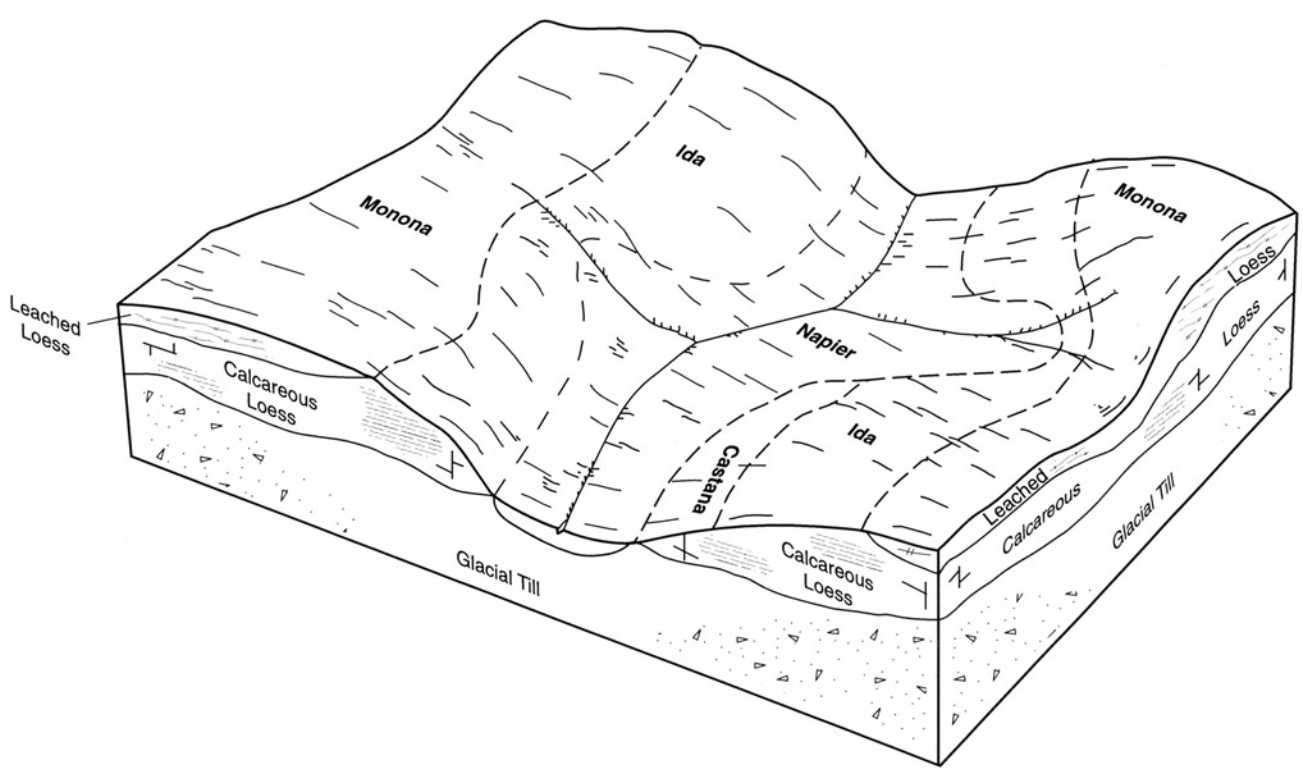

Figure 10.—Typical pattern of soils and parent material in the Monona-Ida-Napier association.

Landform: Uplands and stream terraces
Geomorphic component: Interfluves, head slopes, nose slopes, and side slopes
Hillslope position: Summits and backslopes
Slope range: 0 to 40 percent
Parent material: Loess

Ida

Drainage class: Well drained
Landform: Uplands
Geomorphic component: Interfluves, head slopes, nose slopes, and side slopes
Hillslope position: Summits, shoulders, and backslopes
Slope range: 5 to 40 percent
Parent material: Loess

Napier

Drainage class: Well drained
Landform: Upland drainageways and alluvial fans
Geomorphic component: Base slopes
Hillslope position: Footslopes and toeslopes
Slope range: 2 to 14 percent
Parent material: Silty alluvium

Minor Soils

- Castana soils, which are more alkaline than the Monona and Napier soils and have a thicker dark surface layer than the Ida soils; on high footslopes

Major Uses

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Formation and Classification of the Soils

This section relates the soils in the survey area to the major factors and processes of soil formation and describes the system of soil classification.

Factors and Processes of Soil Formation

Soil is a natural body of mineral and organic constituents that have formed over time through a process of chemical and physical weathering. It is influenced by climatic conditions. Five major factors interact with each other to influence the formation of soil. These are parent material; the climate under which the soils formed; the biological processes of plants and animals in and on the soil; relief or topography; and the length of time the forces have acted on the parent materials (Jenny, 1941). Human activities have also had a significant effect on the formation of the soils.

Climate and biological processes are the active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it into a natural body that has genetically related horizons. The effects of climate and biological processes are conditioned by relief. The parent material also affects the kind of profile that can be formed, and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil. Usually, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four.

Horizons are differentiated from each other when four basic kinds of processes take place. These processes are additions, removals, transfers, and transformations. Each of these processes affects many substances in the soils, such as organic matter, soluble salts, carbonates, sesquioxides, and silicate clay materials. Most of these processes tend to promote horizon differentiation, but some tend to offset or retard it. The processes and the resulting changes occur simultaneously in soils. The ultimate nature of the profile is governed by the balance of these changes within the soil.

An accumulation of organic matter generally is an early phase of horizon differentiation. It has been an important process in the differentiation of horizons in the soils of Monona County. The amount of organic matter that has accumulated in the surface layer of the soils ranges from high to very low. In some soils the content of organic matter was once fairly high but is now low because of erosion.

The removal of substances from parts of the soil profile is important in the differentiation of horizons. The downward movement of calcium carbonates and bases is an example. The upper part of the soils in Monona County has been leached of calcium carbonate. Many soils have been so strongly leached that they are strongly acid or very strongly acid even in the subsoil.

Phosphorus is removed from the subsoil by plant roots and transferred to the parts of the plant growing above the ground. It is then returned to the surface layer in the plant residue. This process affects the form and distribution of phosphorus in the profile. The translocation of silicate clay minerals is another important process. The clay minerals in the surface layer are carried downward in suspension by percolating water. They accumulate in the subsoil as fillings in pores and root channels and as clay films. This process has affected many of the soils in the county. In other soils, however, the clay content of the surface layer is not markedly different from that of the underlying layer and other evidence of clay movement is minimal.

Another kind of transfer occurs when cracks form as a result of shrinking and swelling. Because of the cracks, some of the material from the surface layer is transferred to the lower parts of the profile. This transfer is minimal in most soils. It is most common in very clayey soils. It can occur in Luton and Tieville soils.

Transformations are physical and chemical. The weathering of soil particles to smaller sizes is an example of transformation. The reduction of iron is another example. This process is called gleying. It occurs when the soil is saturated for long periods. The

soil contains enough organic matter for biological activity to take place during periods of saturation. Gleying is evidenced by ferrous iron and gray colors in the soil. It is characteristic of poorly drained soils. The content of reductive extractable iron, or free iron, generally is lower in somewhat poorly drained soils. Another kind of transformation is the weathering of the primary apatite minerals in the parent material to secondary phosphorus compounds.

Climate

The soils in Monona County formed under variable climatic conditions. During the post-Cary glaciation period, from about 13,000 to 10,500 years ago, the climate in central Iowa was cool and the vegetation was dominantly conifers. During the period from 10,500 to 8,000 years ago, a warming trend took place, and the vegetation changed from conifers to mixed forest dominated by hardwoods. Beginning about 8,000 years ago, the climate became even warmer and drier. Herbaceous prairie vegetation became dominant. The forest-prairie transition of central Iowa changed in post-glacial climate from relatively dry prairie to more moist conditions. This change may have taken place about 3,000 years ago. Presently the survey area has a mid-continental subhumid climate.

Nearly uniform climate prevails throughout the county. The influence of the general climate, however, is modified by local conditions. Microclimates are a result of topography and vegetation. For example, in areas of Hamburg soils on very steep bluffs, most of the water runs off or soaks rapidly into the soil. Thus, in these areas the climate is warmer and drier than in the nearby less sloping areas. On south-facing slopes the effect is similar. North- and east-facing slopes tend to be cooler and more moist than south-facing slopes and thus, under a climate such as that in Monona County, are more likely to support natural stands of trees. Low-lying or depressional, poorly drained or very poorly drained soils are wetter and colder than most of the soils in areas around them.

The general climate has had an important overall influence on the characteristics of the soils but has not caused major differences among them. The local climate differences influence the characteristics of the soils and account for some of the differences in soils within the same climatic region.

Weathering of the parent material by water and air is activated by changes in temperature. As a result of weathering, changes caused by both physical and chemical actions take place. Rainfall has influenced the formation of the soils through its effect on the amount of leaching in soils and on the kinds of plants that grow.

Some variations in plant and animal life are caused by variation in temperature or by the action of other climatic forces on the soil material. To that extent, climate influences changes in soils that are brought about by differences in plant and animal populations.

Living Organisms

Several kinds of biological organisms affect soil formation. Burrowing animals, worms, crayfish, and such micro-organisms as fungus, actinomyces, and bacteria influence soil properties. Differences in the kind of vegetation, however, commonly cause the most marked differences among soils.

Tall grasses were the dominant vegetation when the survey area was first settled. Trees grew in some places, mainly in steep areas within a few miles of the Missouri River Valley and along streams. The thickest stands were on north- and east-facing slopes.

Because grasses have many roots and tops that decay, soils that formed on prairies typically have a thicker, darker surface layer than the soils that formed under trees. The organic matter in the soils that formed under trees is derived principally from fallen leaves. These soils generally are more acid than the soils that formed under grasses. Monona and Ida soils are typical prairie soils. The stands of trees on these soils have not been in place long enough to have had a significant effect on soil formation.

Relief and Drainage

Relief, or topography, refers to the lay of the land. The topography of Monona County ranges from the nearly level bottom land on the flood plain along the Missouri River in the west, to the steep angular loess hills and bluffs where the uplands and the bottom land meet, to the rolling hills in the east. The vertical interval between the Missouri River Valley and the loess-covered uplands generally ranges from 200 to 400 feet. The lowest part of the survey area is along the Missouri River in the southwest corner of the county. The highest level, about 1,440 feet above sea level, occurs in several places in the eastern half of the county.

In addition to the Missouri River, the major rivers in the county are the Little Sioux, Maple, and Soldier Rivers. These rivers join with a network of drainage ditches as they cross the Missouri River bottom land before they outlet into the Missouri River. The Missouri River Valley currently has an extensive network of field surface drains and drainage ditches that connect with

the major drainage ditches. This drainage network has changed the use and management of the old bottom land area and has allowed farming to be practiced. This area previously was not farmed because it had been too wet or was subject to frequent flooding.

Landscapes in Monona County range from nearly level to very steep. Relief is an important factor in soil formation because it affects drainage, runoff, the depth to the water table, and erosion and sedimentation. A difference in topography is the basic reason for some of the differences in soil properties.

Topography influences soils that formed in similar parent material. This influence of topography is evident in the color of the soils, thickness of the solum, and horizonation of the soils. Ida and Monona soils are examples of soils that formed in similar parent material but that differ in characteristics mainly related to relief. Some water runs off the well drained, sloping Monona soils, but more water runs off the more strongly sloping Ida soils. Water has eroded the Ida soils at such a rate that little soil formation has taken place. Monona soils have a thicker, darker surface layer than the Ida soils and are leached of carbonates; Ida soils are calcareous at or near the surface. Slope also affects the thickness of the solum. The steeper and more convex the slope, the thinner the solum.

Relief affects the color of the subsoil through its effect on drainage and soil aeration. The subsoil of a soil that has good drainage generally is brown because iron compounds are oxidized and are well distributed throughout. Conversely, the subsoil of soils that have restricted drainage generally is grayish and mottled. The low-lying, poorly drained and very poorly drained, clayey Luton soils on the old bottom land of the Missouri River flood plain have a gray and olive gray subsoil. In contrast, Keg soils, which are at slightly higher elevations, are well drained and have a brownish subsoil.

Parent Material

The soils in Monona County formed in loess, alluvium, and glacial till. Loess is the most extensive parent material in the county. It is a yellowish brown, wind-deposited material that consists mainly of silt particles and small amounts of clay and sand. Small concretions of calcium carbonate also are common in the unleached loess. Most of the upland soils formed in Wisconsin loess. Ida and Monona soils are the most extensive examples.

Hamburg soils are on bluffs adjacent to the Missouri River Valley. The loess is thickest on the bluffs and is thinner in the areas to the east. It ranges from about 200 feet thick at the bluffs in the western part of the county to less than 50 feet thick in the eastern part. In some places, the loess surface has been removed by geologic erosion and glacial till is exposed, typically on very steep side slopes and at the end of nose slopes.

Alluvium is the second most extensive parent material in the county. The largest area is in the Missouri River Valley. Alluvium consists of sediment deposited along major streams and narrow upland drainageways and on low terraces. The texture varies because of the manner in which the sediment was deposited. It can range from sandy to clayey.

The soils that formed in alluvium can be divided into two broad categories. One group formed in alluvium that has been in place long enough to have been affected by the soil-forming processes. Examples are Luton, Blencoe, Keg, Salix, Lakeport, Cooper, and Colo soils. The second group formed in recent alluvium. Examples are Albaton, Blake, Haynie, McPaul, Onawa, and Sarpy soils. Because of the accumulation of organic matter, the first group is darker in the upper part than the second group and is darker to a greater depth.

The texture of the soils that formed in alluvium varies widely. Luton and Albaton soils formed entirely in clayey alluvium. Sarpy soils are loamy and sandy throughout. Haynie, Keg, Kennebec, and McPaul soils are commonly silt loam throughout. Colo and Lakeport soils are dominantly silty clay loam throughout. Some soils have layers of different textures. Examples are Blencoe, Blake, Onawa, Modale, and Percival soils.

Local alluvium has been transported only short distances and retains the characteristics of the parent material of the soil from which it was transported, either by wind or water or both. Napier soils formed in local alluvium and are generally at the base of slopes below soils that formed in loess. Castana soils formed partly in colluvium, which is material that moved downslope as a result of gravity. All of the soils at the base of slopes are similar in texture to the adjacent soils on hillsides.

Human Activities

Important changes take place in the soil after it is drained and cultivated. Changes caused by water erosion generally are the most significant. In many of the cultivated soils in the county, much of the surface layer has been lost through water erosion. Gullies have formed in some places. Tilling the surface layer alters the structure of the soil. Other changes include chemical changes brought about by applications of

lime and fertilizer and the changes in microbial activity and organic matter content that result from removing the native vegetation and growing crops.

Human activities have strongly affected the formation of McPaul and Moville soils on bottom land. These originally dark soils have been covered by a new parent material, which is light colored and calcareous. This material eroded from the uplands, largely as a result of farming.

The soils in the hills of Monona County have undergone a series of cut-and-fill episodes since loess deposition ended. These episodes were the result of changes in climate, and they have influenced the development of the present topography. Prior to recent human occupation and the widespread denudation of the soil surface, the loess-covered area experienced periods of downcutting of streams, healing over, sedimentation, and downcutting again. This process was accelerated after agriculture was introduced in the area. New gullies can occur quickly; however, many years are required for the scars to heal.

Accelerated erosion is often associated with settlement and the commencement of farming. Gullies develop in stages. These stages can be described as channel erosion by downward scour, headward cutting and rapid enlargement, healing, and stabilization. Generally, headward erosion is a process of soil sloughing that works from the watercourse and up a hillside, sometimes with costly results. Bridges, roads that parallel streams and rivers, and driveways and building sites are often threatened or damaged by such erosion.

The process cannot continue if the debris at the base of the ground failure is not allowed to wash away. It is the flushing out of the fallen debris that allows the further sloughing of soil from the face of the failure. The type of soil also plays a role in the amount and type of erosion that takes place. Calcareous loess has vertical headwalls, but leached loess does not. The calcium carbonate acts as a cementing agent.

Time

The length of time that the soil material is acted upon by soil-forming processes affects the kind of soil that forms. The older soils have strongly expressed genetic horizons. Luton and Monona soils are examples. Some soils show little or no evidence of soil formation because they have not been in place long enough for distinct horizons to develop. Albaton and Nodaway soils are examples.

An older soil generally has a higher content of clay in the subsoil than a younger soil that formed in similar parent material. As a soil forms, clay is moved from the surface layer to the subsoil. This transfer increases the content of clay in the subsoil. It is more evident in nearly level soils than in more sloping soils.

In the steeper areas the soil material is generally removed before enough time has passed for the development of a thick profile characterized by strong horizons. Even if the soil material has been in place a long time, the soil still exhibits little development because much of the water runs off the slopes rather than through the soil material.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1999). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 4 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in ***sol***. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udoll (***Ud***, meaning humid, plus ***oll***, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludolls (***Hapl***, meaning minimal horizonation, plus ***udoll***, the suborder of the Mollisols that has a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives

preceding the name of the great group. The adjective ***Typic*** identifies the subgroup that typifies the great group. An example is Typic Hapludolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineralogy class, cation-exchange activity class, soil temperature regime, soil depth, and reaction class. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed, mesic Typic Hapludolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series. The Monona series is an example.

Table 5 shows the acreage and proportionate extent of the soils in the survey area.

Table 4.--Classification of the Soils

Soil name	Family or higher taxonomic class
Ackmore	Aeric Fluvaquents, fine-silty, mixed, nonacid, mesic
Albaton	Vertic Fluvaquents, very fine, montmorillonitic (calcareous), mesic
Blake	Aquic Udifluvents, fine-silty, mixed (calcareous), mesic
Blencoe	Aquertic Hapludolls, clayey over loamy, montmorillonitic, mesic
Blend	Fluvaquentic Endoaquolls, fine, montmorillonitic, mesic
Burcham	Aquic Hapludolls, fine-silty over clayey, mixed, mesic
Castana	Entic Hapludolls, fine-silty, mixed, mesic
Colo	Cumulic Endoaquolls, fine-silty, mixed, mesic
Cooper	Fluvaquentic Hapludolls, fine-silty over clayey, mixed, mesic
Forney	Vertic Fluvaquents, fine, montmorillonitic, nonacid, mesic
Grable	Mollic Udifluvents, coarse-silty over sandy or sandy-skeletal, mixed (calcareous), mesic
Grantcenter	Aquic Hapludolls, fine-silty, mixed, mesic
Hamburg	Typic Udorthents, coarse-silty, mixed (calcareous), mesic
Haynie	Mollic Udifluvents, coarse-silty, mixed (calcareous), mesic
Hornick	Aquic Hapludolls, fine-silty over clayey, mixed, mesic
Ida	Typic Udorthents, fine-silty, mixed (calcareous), mesic
Keg	Typic Hapludolls, fine-silty, mixed, mesic
Kenmoor	Aquic Udifluvents, sandy over clayey, mixed (calcareous), mesic
Kennebec	Cumulic Hapludolls, fine-silty, mixed, mesic
Lakeport	Aquic Hapludolls, fine, montmorillonitic, mesic
Larpenteur	Aquic Hapludolls, fine-silty, mixed (calcareous), mesic
Lossing	Aquic Udifluvents, fine-silty, mixed (calcareous), mesic
Luton	Vertic Endoaquolls, very fine, montmorillonitic, mesic
McPaul	Mollic Udifluvents, coarse-silty, mixed (calcareous), mesic
Modale	Aquic Udifluvents, coarse-silty over clayey, mixed (calcareous), mesic
Monona	Typic Hapludolls, fine-silty, mixed, mesic
Morconick	Mollic Udifluvents, sandy, mixed (calcareous), mesic
Moville	Aquic Udifluvents, coarse-silty over clayey, mixed (calcareous), mesic
Napa	Typic Natraquerts, fine, montmorillonitic, mesic
Napier	Cumulic Hapludolls, fine-silty, mixed, mesic
Nishna	Cumulic Vertic Endoaquolls, fine, montmorillonitic (calcareous), mesic
Nodaway	Mollic Udifluvents, fine-silty, mixed, nonacid, mesic
Onawa	Aquic Udifluvents, clayey over loamy, montmorillonitic (calcareous), mesic
Owego	Mollic Fluvaquents, fine, montmorillonitic, nonacid, mesic
Percival	Aquic Udifluvents, clayey over sandy or sandy-skeletal, montmorillonitic (calcareous), mesic
Rawles	Mollic Udifluvents, fine-silty, mixed (calcareous), mesic
Rodney	Mollic Fluvaquents, fine-silty over clayey, mixed (calcareous), mesic
Salix	Typic Hapludolls, fine-silty, mixed, mesic
Sarpy	Typic Udipsamments, mixed, mesic
Scroll	Aquic Udifluvents, fine-silty over sandy or sandy-skeletal, mixed (calcareous), mesic
Smithland	Aquic Cumulic Hapludolls, fine-silty, mixed, mesic
Steinauer	Typic Udorthents, fine-loamy, mixed (calcareous), mesic
Ticonic	Typic Udifluvents, sandy over loamy, mixed (calcareous), mesic
Tieville	Vertic Endoaquolls, fine, montmorillonitic (calcareous), mesic
Uturin	Mollic Fluvaquents, fine-silty, mixed (calcareous), mesic
Vore	Aquic Udifluvents, fine-silty over sandy or sandy-skeletal, mixed (calcareous), mesic
Woodbury	Vertic Endoaquolls, fine, montmorillonitic, mesic
Zook	Cumulic Vertic Endoaquolls, fine, montmorillonitic, mesic

Table 5.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
1C	Ida silt loam, 5 to 9 percent slopes	2,316	0.5
1C3	Ida silt loam, 5 to 9 percent slopes, severely eroded	3,641	0.8
1D	Ida silt loam, 9 to 14 percent slopes	4,787	1.1
1D3	Ida silt loam, 9 to 14 percent slopes, severely eroded	10,424	2.3
1E	Ida silt loam, 14 to 20 percent slopes	4,804	1.1
1E3	Ida silt loam, 14 to 20 percent slopes, severely eroded	21,791	4.9
1F	Ida silt loam, 20 to 30 percent slopes	15,138	3.4
1F3	Ida silt loam, 20 to 30 percent slopes, severely eroded	11,090	2.5
1G	Ida silt loam, 30 to 40 percent slopes	8,622	1.9
2G	Hamburg silt loam, 40 to 75 percent slopes	5,295	1.2
3D	Castana silt loam, 9 to 14 percent slopes	1,918	0.4
3E	Castana silt loam, 14 to 20 percent slopes	9,853	2.2
3F	Castana silt loam, 20 to 30 percent slopes	913	0.2
10B	Monona silt loam, 2 to 5 percent slopes	825	0.2
10C	Monona silt loam, 5 to 9 percent slopes	844	0.2
10C2	Monona silt loam, 5 to 9 percent slopes, moderately eroded	13,614	3.0
10C3	Monona silt loam, 5 to 9 percent slopes, severely eroded	236	*
10D	Monona silt loam, 9 to 14 percent slopes	1,179	0.3
10D2	Monona silt loam, 9 to 14 percent slopes, moderately eroded	10,483	2.3
10D3	Monona silt loam, 9 to 14 percent slopes, severely eroded	1,783	0.4
10E	Monona silt loam, 14 to 20 percent slopes	1,018	0.2
10E2	Monona silt loam, 14 to 20 percent slopes, moderately eroded	5,220	1.2
10E3	Monona silt loam, 14 to 20 percent slopes, severely eroded	1,848	0.4
10F	Monona silt loam, 20 to 30 percent slopes	1,428	0.3
10F2	Monona silt loam, 20 to 30 percent slopes, moderately eroded	655	0.1
10F3	Monona silt loam, 20 to 30 percent slopes, severely eroded	415	*
10G	Monona silt loam, 30 to 40 percent slopes	595	0.1
12B	Napier silt loam, 2 to 5 percent slopes	8,984	2.0
12C	Napier silt loam, 5 to 9 percent slopes	34,888	7.8
12D	Napier silt loam, 9 to 14 percent slopes	16,906	3.7
17B	Napier-Kennebec-Colo complex, 0 to 5 percent slopes	2,477	0.5
33D	Steinauer clay loam, 9 to 14 percent slopes	15	*
33E	Steinauer clay loam, 14 to 18 percent slopes	166	*
33F	Steinauer clay loam, 18 to 25 percent slopes	293	*
33G	Steinauer clay loam, 25 to 40 percent slopes	210	*
36	Salix silty clay loam, 0 to 2 percent slopes, rarely flooded	8,877	2.0
44	Blencoe silty clay, 0 to 2 percent slopes, rarely flooded	6,707	1.5
46	Keg silt loam, 0 to 2 percent slopes, rarely flooded	1,763	0.4
54	Zook silty clay loam, 0 to 2 percent slopes, occasionally flooded	2,231	0.5
54+	Zook silt loam, 0 to 2 percent slopes, occasionally flooded, overwash	313	*
66	Luton silty clay, 0 to 1 percent slopes, rarely flooded	57,371	12.8
66+	Luton silt loam, 0 to 1 percent slopes, rarely flooded, overwash	523	0.1
67	Woodbury silty clay, 0 to 2 percent slopes, rarely flooded	7,034	1.6
68	Napa silty clay loam, 0 to 2 percent slopes, rarely flooded	361	*
70	McPaul silt loam, 0 to 2 percent slopes, rarely flooded	5,116	1.1
123	Grantcenter silty clay loam, 0 to 2 percent slopes, rarely flooded	4,433	1.0
133	Colo silty clay loam, 0 to 2 percent slopes, occasionally flooded	1,785	0.4
133+	Colo silt loam, 0 to 2 percent slopes, occasionally flooded, overwash	570	0.1
137	Haynie silt loam, 0 to 2 percent slopes, rarely flooded	4,791	1.1
144	Blake silty clay loam, 0 to 2 percent slopes, rarely flooded	3,078	0.7
145	Onawa silt loam, 0 to 2 percent slopes, rarely flooded	798	0.2
146	Onawa silty clay, 0 to 2 percent slopes, rarely flooded	9,907	2.2
147	Modale silty clay loam, 0 to 2 percent slopes, rarely flooded	1,078	0.2
149	Modale silt loam, 0 to 2 percent slopes, rarely flooded	1,919	0.4
155	Albaton silty clay loam, 0 to 2 percent slopes, rarely flooded	259	*
156	Albaton silty clay, 0 to 2 percent slopes, rarely flooded	14,148	3.2
157	Albaton silt loam, 0 to 2 percent slopes, rarely flooded	542	0.1
212	Kennebec silt loam, 0 to 2 percent slopes, occasionally flooded	6,327	1.4
212+	Kennebec silt loam, 0 to 2 percent slopes, occasionally flooded, overwash	2,143	0.5
220	Nodaway silt loam, 0 to 2 percent slopes, occasionally flooded	1,289	0.3
234	Nishna silty clay loam, 0 to 2 percent slopes, occasionally flooded	535	0.1
237	Sarpy loamy fine sand, 0 to 2 percent slopes, rarely flooded	1,020	0.2

See footnote at end of table.

Table 5.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
237B	Sarpy loamy fine sand, 2 to 5 percent slopes, rarely flooded	402	*
244	Blend silty clay, 0 to 2 percent slopes, rarely flooded	2,577	0.6
255	Cooper silty clay loam, 0 to 2 percent slopes, rarely flooded	2,583	0.6
257	Uturin silt loam, 0 to 2 percent slopes, occasionally flooded	188	*
266	Smithland silty clay loam, 0 to 2 percent slopes, occasionally flooded	2,160	0.5
275	Moville silt loam, 0 to 2 percent slopes, rarely flooded	1,375	0.3
366	Luton silty clay loam, 0 to 1 percent slopes, rarely flooded	2,283	0.5
430	Ackmore silt loam, 0 to 2 percent slopes, occasionally flooded	781	0.2
436	Lakeport silty clay loam, 0 to 2 percent slopes, rarely flooded	3,671	0.8
446	Burcham silt loam, 0 to 2 percent slopes, rarely flooded	180	*
465	Tieville silty clay, 0 to 2 percent slopes, rarely flooded	5,858	1.3
510	Monona silt loam, bench, 0 to 2 percent slopes	1,897	0.4
510B	Monona silt loam, bench, 2 to 5 percent slopes	4,578	1.0
510C	Monona silt loam, bench, 5 to 9 percent slopes	517	0.1
510C2	Monona silt loam, bench, 5 to 9 percent slopes, moderately eroded	2,137	0.5
510C3	Monona silt loam, bench, 5 to 9 percent slopes, severely eroded	110	*
514	Grable silt loam, 0 to 2 percent slopes, rarely flooded	1,900	0.4
515	Percival silty clay, 0 to 2 percent slopes, rarely flooded	1,980	0.4
516	Vore silty clay loam, 0 to 2 percent slopes, rarely flooded	675	0.2
552	Owego silty clay, 0 to 2 percent slopes, rarely flooded	4,052	0.9
553	Forney silty clay, 0 to 2 percent slopes, rarely flooded	8,106	1.8
670	Rawles silt loam, 0 to 2 percent slopes, occasionally flooded	6,480	1.4
717D	Napier-Gullied land complex, 5 to 14 percent slopes	1,863	0.4
746	Lossing silty clay, 0 to 2 percent slopes, rarely flooded	5,767	1.3
747	Rodney silty clay, 0 to 2 percent slopes, rarely flooded	1,656	0.4
748	Hornick silty clay, 0 to 2 percent slopes, rarely flooded	1,495	0.3
754	Larpenteur silt loam, 0 to 2 percent slopes, rarely flooded	1,809	0.4
945	Albaton silty clay, depressional, drained, 0 to 1 percent slopes, frequently flooded	638	0.1
946	Albaton silty clay, depressional, undrained, 0 to 1 percent slopes, frequently flooded	1,887	0.4
1137	Haynie silt loam, 0 to 2 percent slopes, occasionally flooded	1,415	0.3
1144	Blake silty clay loam, 0 to 2 percent slopes, occasionally flooded	694	0.2
1145	Onawa silt loam, 0 to 2 percent slopes, occasionally flooded	197	*
1146	Onawa silty clay, 0 to 2 percent slopes, occasionally flooded	2,547	0.5
1147	Modale silty clay loam, 0 to 2 percent slopes, occasionally flooded	80	*
1150	Modale silt loam, 0 to 2 percent slopes, occasionally flooded	225	*
1155	Albaton silty clay loam, 0 to 2 percent slopes, occasionally flooded	50	*
1156	Albaton silty clay, 0 to 2 percent slopes, occasionally flooded	3,401	0.8
1157	Albaton silt loam, 0 to 2 percent slopes, occasionally flooded	206	*
1220	Nodaway silt loam, channeled, 0 to 2 percent slopes	670	0.2
1237	Sarpy loamy fine sand, 0 to 2 percent slopes, occasionally flooded	1,714	0.4
1237B	Sarpy loamy fine sand, 2 to 5 percent slopes, occasionally flooded	1,092	0.2
1514	Grable silt loam, 0 to 2 percent slopes, occasionally flooded	1,315	0.3
1515	Percival silty clay, 0 to 2 percent slopes, occasionally flooded	2,752	0.6
1516	Vore silty clay loam, 0 to 2 percent slopes, occasionally flooded	989	0.3
1524	Morconick very fine sandy loam, 0 to 2 percent slopes, occasionally flooded	1,376	0.3
1525	Scroll silty clay, 0 to 2 percent slopes, occasionally flooded	1,008	0.2
1526	Scroll silty clay loam, 0 to 2 percent slopes, occasionally flooded	298	*
1552	Owego silty clay, 0 to 2 percent slopes, occasionally flooded	108	*
1746	Lossing silty clay, 0 to 2 percent slopes, occasionally flooded	760	0.2
1747	Rodney silty clay, 0 to 2 percent slopes, occasionally flooded	74	*
1750	Ticonic fine sand, 0 to 2 percent slopes, occasionally flooded	561	0.1
1849	Kenmoor fine sandy loam, 0 to 2 percent slopes, occasionally flooded	336	*
5010	Pits, sand and gravel	123	*
5040	Orthents, loamy	321	*
5044	Fluvaquents, frequently flooded	677	0.2
5045	Aquents, loamy, rarely flooded	334	*
5046	Aquents, ponded, rarely flooded	186	*
5047	Aquents, ponded, occasionally flooded	264	*
5051	Fluvaquents, ponded	121	*
5090	Aquents-Orthents complex	175	*
AW	Animal waste	2	*

See footnote at end of table.

Table 5.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
SL	Sewage lagoon	28	*
W	Water	4,004	0.9
	Total	447,300	100.0

* Less than 0.1 percent.

Soil Series and Detailed Soil Map Units

In this section, arranged in alphabetical order, each soil series recognized in the survey area is described. Each series description is followed by descriptions of the associated detailed soil map units.

Characteristics of the soil and the material in which it formed are identified for each soil series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the “Soil Survey Manual” (Soil Survey Division Staff, 1993). Many of the technical terms used in the descriptions are defined in “Soil Taxonomy” (Soil Survey Staff, 1999). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units on the detailed soil maps in this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information about each map unit is given in Part II of this survey.

A map unit delineation on the detailed soil maps represents an area on the landscape and consists of one or more soils or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some “included” areas that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit. The principal hazards and limitations to be considered in planning for specific uses are described in Part II of this survey.

Soils that have profiles that are almost alike make up a ***soil series***. Except for differences in texture of the surface layer or of the underlying layers, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying layers. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is

divided into ***soil phases***. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Monona silt loam, 5 to 9 percent slopes, is a phase of the Monona series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are called complexes. A ***complex*** consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Napier-Kennebec-Colo complex, 0 to 5 percent slopes, is an example.

This survey includes ***miscellaneous areas***. Such areas have little or no soil material and support little or no vegetation. The map unit Pits, sand and gravel, is an example.

Table 5 in Parts I and II of this survey gives the acreage and proportionate extent of each map unit. Other tables (see Contents in Part II) give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

Some terms used in this survey to describe specific geomorphic regions and features, such as ***bar area, young bottom land,*** and ***old bottom land***, are defined under the heading "Physiography, Drainage, and Geology." Other such terms are defined in the Glossary.

Ackmore Series

Drainage class: Somewhat poorly drained
Permeability: Moderate
Landform: Flood plains
Geomorphic component: Footslopes and toeslopes
Parent material: Silty alluvium
Native vegetation: Prairie
Slope range: 0 to 2 percent

Typical Pedon

Ackmore silt loam, 0 to 2 percent slopes, occasionally flooded, in a cultivated field; 1,100 feet east and 150 feet south of the northwest corner of sec. 29, T. 84 N., R. 44 W.; U.S.G.S. Topographic Quadrangle Castana, Iowa; lat. 42 degrees 4 minutes 49 seconds N. and long. 95 degrees 58 minutes 55 seconds W.

Ap—0 to 7 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; many fine roots throughout; slightly acid; abrupt smooth boundary.

C—7 to 26 inches; stratified very dark grayish brown (10YR 3/2) and grayish brown (10YR 5/2) silt loam; few fine distinct brown (7.5YR 4/4) redox concentrations; massive; friable; few fine roots throughout; neutral; clear smooth boundary.

2Ab1—26 to 36 inches; black (10YR 2/1) silty clay loam; few fine distinct brown (7.5YR 4/4) redox concentrations; weak fine subangular blocky structure parting to weak fine granular; friable; few dark grayish brown silt coatings on faces of peds; few fine roots throughout; neutral; gradual smooth boundary.

2Ab2—36 to 50 inches; very dark gray (10YR 3/1) silty clay loam; black (10YR 2/1) organic coatings on faces of peds; few fine distinct brown (7.5YR 4/4) redox concentrations; moderate medium subangular blocky structure; friable; few fine roots throughout; moderately alkaline; gradual smooth boundary.

2AC—50 to 72 inches; very dark gray (10YR 3/1) silty clay; common fine distinct dark brown (7.5YR 4/4) redox concentrations; weak fine prismatic structure; firm; few fine roots throughout; slightly alkaline.

Range in Characteristics

Combined thickness of the A and C horizons: 20 to 36 inches
Thickness of the solum: 5 to 10 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam or silty clay loam

C horizon:
Hue—10YR
Value—2 to 5
Chroma—1 or 2
Texture—silt loam or silty clay loam

2A horizon:
Hue—N or 10YR
Value—2 or 3
Chroma—0 or 1
Texture—silt loam or silty clay loam

430—Ackmore silt loam, 0 to 2 percent slopes, occasionally flooded

Composition

Ackmore and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flood plains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 72 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Silty alluvium
Frequency of flooding: Occasional
Depth to the water table: 2 to 4 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 12.1 inches (high)
Content of organic matter in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Nodaway and similar soils
- Colo and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Albaton Series

Drainage class: Poorly drained and very poorly drained
Permeability: Very slow
Landform: Flood plains (bar area, young bottom land, depressions)
Parent material: Clayey alluvium and silty over clayey alluvium
Native vegetation: Mixed prairie grasses and deciduous trees
Slope range: 0 to 2 percent

Typical Pedon

Albaton silty clay, 0 to 2 percent slopes, rarely flooded, in a cultivated field; 100 feet north and 115 feet east of the southwest corner of sec. 24, T. 85 N., R. 47 W.; U.S.G.S. Topographic Quadrangle Albaton, Iowa; lat. 42 degrees 9 minutes 15 seconds N. and long. 96 degrees 16 minutes 13 seconds W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silty clay; moderate fine and very fine granular structure; firm; few very fine roots throughout; slightly effervescent; slightly alkaline; abrupt smooth boundary.

Cg1—8 to 20 inches; dark grayish brown (2.5Y 4/2) silty clay; common fine distinct yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) redox concentrations; massive with evidence of parting along planes of weakness; firm; few very fine roots in cracks; faint very dark grayish brown (2.5Y 3/2) discontinuous coatings on faces of cleavage planes and in pores; strongly effervescent; moderately alkaline; gradual smooth boundary.

Cg2—20 to 72 inches; olive gray (5Y 5/2) silty clay; few fine distinct reddish brown (5YR 4/4) and strong brown (7.5YR 5/6) redox concentrations; massive with evidence of parting along planes of weakness; firm; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the solum: 6 to 9 inches
Depth to carbonates: 0 to 9 inches

Ap or A horizon:
Hue—10YR or 2.5Y
Value—3
Chroma—1 or 2
Texture—silty clay or silt loam

Cg horizon:
Hue—5Y, 2.5Y, or N
Value—4 or 5
Chroma—0 to 2
Texture—silty clay

155—Albaton silty clay loam, 0 to 2 percent slopes, rarely flooded

Composition

Albaton and similar soils: 100 percent

Setting

Landform: Flood plains (young bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay loam
Depth to bedrock: More than 72 inches
Drainage class: Poorly drained
Dominant parent material: Silty alluvium over clayey alluvium
Frequency of flooding: Rare
Water table depth: At the surface to 1 foot below the surface
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 8.6 inches (moderate)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

156—Albaton silty clay, 0 to 2 percent slopes, rarely flooded

Composition

Albaton and similar soils: 100 percent

Setting

Landform: Flood plains (young bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay
Depth to bedrock: More than 72 inches
Drainage class: Poorly drained
Dominant parent material: Clayey alluvium
Frequency of flooding: Rare
Water table depth: At the surface to 1 foot below the surface
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 7.2 inches (moderate)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

157—Albaton silt loam, 0 to 2 percent slopes, rarely flooded

Composition

Albaton and similar soils: 100 percent

Setting

Landform: Flood plains (young bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 72 inches
Drainage class: Poorly drained
Dominant parent material: Silty alluvium over clayey alluvium
Frequency of flooding: Rare
Water table depth: At the surface to 1 foot below the surface
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 8.9 inches (moderate)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in

characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

945—Albaton silty clay, depressional, drained, 0 to 1 percent slopes, frequently flooded

Composition

Albaton and similar soils: 100 percent

Setting

Landform: Depressions on flood plains
Slope range: 0 to 1 percent

Component Description

Texture of the surface layer: Silty clay
Depth to bedrock: More than 72 inches
Drainage class: Very poorly drained
Dominant parent material: Clayey alluvium
Frequency of flooding: Frequent
Water table depth: 1 foot above to 1 foot below the surface
Kind of water table: Apparent
Ponding duration: Long
Available water capacity to 60 inches or root-limiting layer: About 7.5 inches (moderate)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

946—Albaton silty clay, depressional, undrained, 0 to 1 percent slopes, frequently flooded

Composition

Albaton and similar soils: 100 percent

Setting

Landform: Depressions on flood plains
Slope range: 0 to 1 percent

Component Description

Texture of the surface layer: Silty clay
Depth to bedrock: More than 72 inches
Drainage class: Very poorly drained
Dominant parent material: Clayey alluvium
Frequency of flooding: Frequent
Water table depth: 1 foot above to 1 foot below the surface
Kind of water table: Apparent
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 7.5 inches (moderate)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- “Wildlife Habitat” section

1155—Albaton silty clay loam, 0 to 2 percent slopes, occasionally flooded

Composition

Albaton and similar soils: 100 percent

Setting

Landform: Flood plains (bar area)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay loam
Depth to bedrock: More than 72 inches
Drainage class: Poorly drained
Dominant parent material: Silty alluvium over clayey alluvium
Frequency of flooding: Occasional
Water table depth: At the surface to 1 foot below the surface
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 8.6 inches (moderate)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

1156—Albaton silty clay, 0 to 2 percent slopes, occasionally flooded

Composition

Albaton and similar soils: 100 percent

Setting

Landform: Flood plains (bar area)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay
Depth to bedrock: More than 72 inches
Drainage class: Poorly drained
Dominant parent material: Clayey alluvium
Frequency of flooding: Occasional
Water table depth: At the surface to 1 foot below the surface
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 7.2 inches (moderate)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

1157—Albaton silt loam, 0 to 2 percent slopes, occasionally flooded

Composition

Albaton and similar soils: 100 percent

Setting

Landform: Flood plains (bar area)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 72 inches
Drainage class: Poorly drained
Dominant parent material: Silty alluvium over clayey alluvium
Frequency of flooding: Occasional
Water table depth: At the surface to 1 foot below the surface
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 8.9 inches (moderate)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

AW—Animal waste

Component Description

- This map unit consists of a shallow pond constructed to hold animal waste from farm feedlots and livestock packing plants.

5045—Aquents, loamy, rarely flooded

Composition

Aquents: Variable

Component Description

Texture of the surface layer: Variable
Depth to bedrock: More than 60 inches
Frequency of flooding: Rare
Water table depth: 0.5 foot above to 2.0 feet below the surface
Kind of water table: Apparent
Ponding duration: Very long

Major Uses of the Unit

- These soils are too variable to be rated for specific uses.

5046—Aquents, ponded, rarely flooded

Composition

Aquents: Variable

Component Description

Texture of the surface layer: Variable
Depth to bedrock: More than 60 inches
Drainage class: Very poorly drained
Frequency of flooding: Rare
Water table depth: 1 foot above to 1 foot below the surface
Kind of water table: Apparent
Ponding duration: Very long

Major Uses of the Unit

- These soils are too variable to be rated for specific uses.

5047—Aquents, ponded, occasionally flooded

Composition

Aquents: Variable

Component Description

Texture of the surface layer: Variable
Depth to bedrock: More than 60 inches
Drainage class: Very poorly drained
Frequency of flooding: Occasional
Water table depth: 1 foot above to 1 foot below the surface
Kind of water table: Apparent
Ponding duration: Very long

Major Uses of the Unit

- These soils are too variable to be rated for specific uses.

5090—Aquents-Orthents complex

Composition

Aquents: 60 percent
Orthents: 40 percent

Component Description

Aquents

Texture of the surface layer: Variable
Depth to bedrock: More than 60 inches
Frequency of flooding: Rare
Water table depth: 0.5 foot above to 2.0 feet below the surface
Kind of water table: Apparent
Ponding duration: Very long

Orthents

Texture of the surface layer: Loam
Depth to bedrock: More than 60 inches
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.6 inches (moderate)

Additional information specific to this map unit is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- These soils are too variable to be rated for specific uses.

Blake Series

Drainage class: Somewhat poorly drained
Permeability: Moderate
Landform: Flood plains (bar area and young bottom land)
Parent material: Silty alluvium
Native vegetation: Mixed prairie grasses and deciduous trees
Slope range: 0 to 2 percent

Typical Pedon

Blake silty clay loam, 0 to 2 percent slopes, rarely flooded, in a cultivated field; 600 feet north and 150 feet east of the southwest corner of sec. 20, T. 83 N., R. 45 W.; U.S.G.S. Topographic Quadrangle Blencoe, Iowa; lat. 41 degrees 58 minutes 53 seconds N. and long. 96 degrees 6 minutes 59 seconds W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; few fine roots throughout; neutral; abrupt smooth boundary.
Cg1—7 to 26 inches; dark grayish brown (2.5Y 4/2) silty clay loam; very dark grayish brown (2.5Y 3/2) on faces of peds; few fine distinct brown (7.5YR 4/4) redox concentrations; very weak fine subangular blocky structure; friable; few fine roots throughout; strongly effervescent; slightly alkaline; clear smooth boundary.
Cg2—26 to 60 inches; dark grayish brown (2.5Y 4/2) silt loam; few fine distinct brown (7.5YR 4/4) redox concentrations; massive with evidence of horizontal parting; friable; few fine roots throughout; very few faint very dark grayish brown (2.5Y 3/2) continuous stains on horizontal faces of cleavage planes; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the solum: 6 to 10 inches
Depth to carbonates: 0 to 10 inches

Ap or A horizon:
Hue—10YR
Value—3 or 4
Chroma—1 or 2
Texture—silty clay loam

Cg1 horizon:
Hue—10YR or 2.5Y
Value—3 or 4
Chroma—1 to 4
Texture—silty clay loam

Cg2 horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 or 3
Texture—silt loam, loam, or very fine sandy loam

144—Blake silty clay loam, 0 to 2 percent slopes, rarely flooded

Composition

Blake and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flood plains (young bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay loam
Depth to bedrock: More than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Silty alluvium
Frequency of flooding: Rare
Depth to the water table: 2 to 4 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 12.6 inches (high)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Moderately well drained soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

1144—Blake silty clay loam, 0 to 2 percent slopes, occasionally flooded

Composition

Blake and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flood plains (bar area)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay loam
Depth to bedrock: More than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Silty alluvium
Frequency of flooding: Occasional
Depth to the water table: 2 to 4 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 12.6 inches (high)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Moderately well drained soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Blencoe Series

Drainage class: Somewhat poorly drained
Permeability: Slow
Landform: Flood plains (old bottom land)
Parent material: Silty alluvium over clayey alluvium
Native vegetation: Prairie
Slope range: 0 to 2 percent

Typical Pedon

Blencoe silty clay, 0 to 2 percent slopes, rarely flooded, in a cultivated field; 2,580 feet south and 150 feet east of the northwest corner of sec. 22, T. 84 N., R. 45 W.; U.S.G.S. Topographic Quadrangle Onawa, Iowa; lat. 42 degrees 4 minutes 31 seconds N. and long. 96 degrees 4 minutes 32 seconds W.

Ap—0 to 8 inches; black (N 2/0) silty clay, black (10YR 2/1) dry; moderate fine subangular blocky structure parting to weak fine granular; firm; few fine roots throughout; few fine discontinuous tubular pores; neutral; abrupt smooth boundary.

A—8 to 19 inches; black (N 2/0) silty clay, black (10YR 2/1) dry; moderate fine and medium subangular blocky structure; firm; few fine roots throughout; few fine discontinuous tubular pores; neutral; clear smooth boundary.

Bw—19 to 27 inches; dark grayish brown (2.5Y 4/2) silty clay; black (10YR 2/1) on faces of a few peds; few fine prominent yellowish brown (10YR 5/6) redox concentrations; moderate fine and medium subangular blocky structure; firm; neutral; clear smooth boundary.

BC—27 to 33 inches; olive brown (2.5Y 4/4) silty clay loam; common fine prominent yellowish brown (10YR 5/6) redox concentrations; weak medium prismatic structure; friable; few fine and medium irregular dark nodules; neutral; abrupt smooth boundary.

2Cg1—33 to 56 inches; grayish brown (2.5Y 5/2) silt loam; common fine prominent strong brown (7.5YR 5/6) and olive brown (2.5Y 4/4) redox concentrations; massive; friable; few fine and medium irregular dark nodules; very slightly effervescent; slightly alkaline; clear smooth boundary.

2Cg2—56 to 60 inches; grayish brown (2.5Y 5/2) silt loam; common fine distinct strong brown (7.5YR 5/6) redox concentrations; massive; friable; few fine and medium irregular dark nodules and few fine irregular soft masses of lime; strongly effervescent; strongly alkaline.

Range in Characteristics

Thickness of the solum: 25 to 40 inches
Thickness of the mollic epipedon: 14 to 24 inches
Depth to carbonates: 25 to 40 inches

Ap and A horizons:
Hue—10YR or N
Value—2 or 3

Chroma—0 to 2
Texture—silty clay

Bw horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2
Texture—silty clay

2Cg horizon:
Hue—10YR or 2.5Y
Value—5
Chroma—2
Texture—silt loam

44—Blencoe silty clay, 0 to 2 percent slopes, rarely flooded

Composition

Blencoe and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains (old bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay
Depth to bedrock: More than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Silty alluvium over clayey alluvium
Frequency of flooding: Rare
Depth to the water table: 2 to 4 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 10.3 inches (high)
Content of organic matter in the surface layer: About 4 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Woodbury and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Blend Series

Drainage class: Poorly drained
Permeability: Very slow
Landform: Flood plains (old bottom land)
Parent material: Silty alluvium over clayey alluvium
Native vegetation: Prairie
Slope range: 0 to 2 percent

Typical Pedon

Blend silty clay, 0 to 2 percent slopes, rarely flooded, in a cultivated field; 75 feet south and 75 feet east of the northwest corner of sec. 22, T. 83 N., R. 45 W.; U.S.G.S. Topographic Quadrangle Blencoe, Iowa; lat. 41 degrees 59 minutes 37 seconds N. and long. 96 degrees 4 minutes 40 seconds W.

Ap—0 to 7 inches; black (10YR 2/1) silty clay, very dark grayish brown (2.5Y 3/2) dry; moderate fine angular and subangular blocky structure; firm; few fine roots in mat at top of horizon; many fine tubular pores; neutral; abrupt smooth boundary.

A—7 to 17 inches; black (10YR 2/1) silty clay, very dark grayish brown (2.5Y 3/2) dry; moderate fine subangular blocky structure parting to moderate fine granular; firm; few fine roots throughout; neutral; gradual smooth boundary.

2Bwg—17 to 31 inches; dark grayish brown (2.5Y 4/2) silty clay loam; black (10YR 2/1) on faces of peds; few fine faint light olive brown (2.5Y 5/4) redox concentrations; weak fine and medium subangular blocky structure; friable; few faint very dark grayish brown (2.5Y 3/2) discontinuous coatings on faces of peds; neutral; gradual smooth boundary.

3Agb—31 to 42 inches; dark grayish brown (2.5Y 4/2) silty clay; few fine faint olive brown (2.5Y 4/4) redox concentrations; moderate medium prismatic structure; firm; common fine rounded carbonate concretions; strongly effervescent; slightly alkaline; clear smooth boundary.

3Cg1—42 to 47 inches; dark grayish brown (2.5Y 4/2) silty clay; very dark grayish brown (2.5Y 3/2) faces of peds; common fine distinct dark yellowish brown (10YR 4/4) redox concentrations; moderate medium prismatic structure; firm; common fine rounded carbonate concretions; slightly effervescent; slightly alkaline; clear smooth boundary.

3Cg2—47 to 60 inches; mottled olive brown (2.5Y 4/4) and grayish brown (2.5Y 5/2) silty clay; massive with evidence of parting along planes of weakness; very firm; few fine irregular soft masses of carbonate and few fine rounded carbonate concretions; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the solum: 24 to 43 inches
Thickness of the mollic epipedon: 10 to 18 inches
Depth to carbonates: 18 to 50 inches

Ap and A horizons:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silty clay

2Bwg horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—1 or 2
Texture—silty clay loam

3Agb horizon:
Hue—10YR or 2.5Y
Value—2 to 5
Chroma—1 to 4
Texture—silty clay

3Cg horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—1 to 4
Texture—silty clay

244—Blend silty clay, 0 to 2 percent slopes, rarely flooded

Composition

Blend and similar soils: 100 percent

Setting

Landform: Flood plains (old bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay
Depth to bedrock: More than 60 inches
Drainage class: Poorly drained
Dominant parent material: Silty alluvium over clayey alluvium
Frequency of flooding: Rare
Depth to the water table: 3 to 4 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 8.2 inches (moderate)
Content of organic matter in the surface layer: About 4 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Burcham Series

Drainage class: Somewhat poorly drained
Permeability: Moderate in the upper part and slow in the lower part
Landform: Flood plains (old bottom land)
Parent material: Silty alluvium over clayey alluvium
Native vegetation: Prairie
Slope range: 0 to 2 percent

Typical Pedon

Burcham silt loam, 0 to 2 percent slopes, rarely flooded, in a cultivated field; 1,200 feet west and 100 feet south of the northeast corner of sec. 4, T. 85 N., R. 46 W.; U.S.G.S. Topographic Quadrangle Sloan, Iowa; lat. 42 degrees 12 minutes 38 seconds N. and long. 96 degrees 11 minutes 37 seconds W.

Ap—0 to 7 inches; black (10YR 2/1) silt loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; common fine roots throughout; few fine discontinuous tubular pores; neutral; abrupt smooth boundary.

A—7 to 13 inches; very dark brown (10YR 2/2) and very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; friable; common fine roots throughout; few fine discontinuous tubular pores; neutral; clear smooth boundary.

Bg—13 to 25 inches; dark grayish brown (2.5Y 4/2) and olive brown (2.5Y 4/4) silt loam; few fine distinct strong brown (7.5YR 4/6) redox

concentrations; weak fine subangular blocky structure; friable; common fine roots throughout; few fine discontinuous tubular pores; slightly alkaline; clear smooth boundary.

2Cg1—25 to 42 inches; dark grayish brown (2.5Y 4/2) silty clay; few fine faint grayish brown (2.5Y 5/2) and common fine distinct brown (7.5YR 4/4) and strong brown (7.5YR 4/6) redox concentrations; weak medium prismatic structure parting to weak fine angular blocky; firm; few fine roots throughout; few fine discontinuous tubular pores; few fine rounded gypsum crystals; strongly effervescent; slightly alkaline; clear smooth boundary.

2Cg2—42 to 60 inches; dark grayish brown (2.5Y 4/2) silty clay; common fine distinct dark gray (5Y 4/1) redox depletions; massive; firm; few fine distinct brown (7.5YR 4/4) patchy iron stains throughout; few fine rounded gypsum crystals; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the solum: 20 to 25 inches
Thickness of the mollic epipedon: 10 to 13 inches
Depth to carbonates: 15 to 25 inches

Ap and A horizons:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam

Bg horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—silt loam

2Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—silty clay

446—Burcham silt loam, 0 to 2 percent slopes, rarely flooded

Composition

Burcham and similar soils: 100 percent

Setting

Landform: Flood plains (old bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Silty alluvium over clayey alluvium
Frequency of flooding: Rare
Depth to the water table: 1.5 to 3.0 feet
Kind of water table: Perched
Available water capacity to 60 inches or root-limiting layer: About 9.7 inches (high)
Content of organic matter in the surface layer: About 4 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Castana Series

Drainage class: Well drained
Permeability: Moderate
Landform: Uplands
Geomorphic component: Base slopes
Parent material: Silty alluvium
Native vegetation: Prairie
Slope range: 9 to 30 percent

Typical Pedon

Castana silt loam, 14 to 20 percent slopes, in a hayfield; 900 feet north and 2,490 feet east of the southwest corner of sec. 28, T. 84 N., R. 44 W.; U.S.G.S. Topographic Quadrangle Castana, Iowa; lat. 42 degrees 3 minutes 15 seconds N. and long. 95 degrees 58 minutes 23 seconds W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; weak fine granular structure; friable; many very fine roots throughout; few fine rounded carbonate nodules;

strongly effervescent; slightly alkaline; abrupt smooth boundary.

A—8 to 18 inches; very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak fine and very fine granular structure; friable; many very fine roots throughout; few fine rounded carbonate nodules; strongly effervescent; moderately alkaline; clear smooth boundary.

AC—18 to 30 inches; brown (10YR 4/3) silt loam; weak fine prismatic structure parting to weak fine granular; friable; very dark grayish brown (10YR 3/2) coatings on faces of peds; few fine rounded carbonate nodules; strongly effervescent; moderately alkaline; clear smooth boundary.

C1—30 to 40 inches; brown (10YR 4/3) silt loam; weak medium prismatic structure; friable; dark brown (10YR 3/3) coatings on faces of peds; few fine rounded carbonate nodules; strongly effervescent; moderately alkaline; gradual smooth boundary.

C2—40 to 50 inches; brown (10YR 4/3) silt loam; massive with evidence of parting along planes of weakness; friable; few fine rounded carbonate nodules; strongly effervescent; moderately alkaline; gradual smooth boundary.

C3—50 to 60 inches; brown (10YR 4/3 and 5/3) silt loam; massive with evidence of parting along planes of weakness; friable; few fine rounded carbonate nodules; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the solum: 12 to 30 inches
Thickness of the mollic epipedon: 10 to 20 inches
Depth to carbonates: 0 to 10 inches

Ap and A horizons:
Hue—10YR
Value—2 or 3
Chroma—2
Texture—silt loam

C horizon:
Hue—10YR
Value—4 or 5
Chroma—2 to 4
Texture—silt loam

3D—Castana silt loam, 9 to 14 percent slopes

Composition

Castana and similar soils: 100 percent

Setting

Landform: Uplands
Geomorphic component: Base slopes
Hillslope position: Footslopes
Slope range: 9 to 14 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Silty alluvium
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 13.0 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

3E—Castana silt loam, 14 to 20 percent slopes

Composition

Castana and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Uplands
Geomorphic component: Base slopes
Hillslope position: Footslopes
Slope range: 14 to 20 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Silty alluvium
Flooding: None

Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.9 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Steinauer and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

3F—Castana silt loam, 20 to 30 percent slopes

Composition

Castana and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands
Geomorphic component: Base slopes
Hillslope position: Footslopes
Slope range: 20 to 30 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Silty alluvium
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.9 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Steinauer and similar soils

Major Uses of the Unit

- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Colo Series

Drainage class: Poorly drained
Permeability: Moderate
Landform: Flood plains
Parent material: Silty alluvium
Native vegetation: Prairie
Slope range: 0 to 2 percent

Typical Pedon

Colo silty clay loam, 0 to 2 percent slopes, occasionally flooded, in a cultivated field; 315 feet east and 75 feet south of the northwest corner of sec. 22, T. 85 N., R. 44 W.; U.S.G.S. Topographic Quadrangle Smithland, Iowa; lat. 42 degrees 10 minutes 5 seconds N. and long. 95 degrees 57 minutes 39 seconds W.

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; common fine and medium roots throughout; slightly acid (pH 6.2); abrupt smooth boundary.
A1—8 to 18 inches; black (N 2/0) silty clay loam, black (10YR 2/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; common fine and medium roots throughout; slightly acid (pH 6.4); gradual smooth boundary.
A2—18 to 26 inches; black (N 2/0) silty clay loam, black (10YR 2/1) dry; weak fine and medium subangular blocky structure; friable; common fine roots throughout; neutral (pH 6.6); gradual smooth boundary.
A3—26 to 35 inches; black (N 2/0) silty clay loam, black (10YR 2/1) dry; weak medium subangular blocky structure; friable; common fine roots throughout; neutral (pH 6.6); gradual smooth boundary.
Bg—35 to 42 inches; black (10YR 2/1) silty clay loam; black (N 2/0) on faces of a few peds; weak

medium prismatic structure parting to weak fine and medium subangular blocky; friable; common fine roots throughout; neutral (pH 6.6); gradual smooth boundary.

BCg—42 to 51 inches; black (10YR 2/1) silty clay loam; common fine distinct brown (7.5YR 5/4) and strong brown (7.5YR 5/6) redox concentrations; weak medium and coarse prismatic structure; friable; few fine roots throughout; neutral (pH 6.8); gradual smooth boundary.

Cg—51 to 60 inches; silty clay loam, very dark gray (10YR 3/1), dark grayish brown (10YR 4/2), and grayish brown (10YR 5/2) crushed; common fine distinct brown (7.5YR 5/4) and strong brown (7.5YR 5/6) redox concentrations; massive; friable; neutral (pH 7.0).

Range in Characteristics

Thickness of the solum: 36 to 60 inches
Thickness of the mollic epipedon: 36 inches or more
Depth to carbonates: 60 inches or more

Ap and A horizons:
Hue—10YR or N
Value—2 or 3
Chroma—0 or 1
Texture—silty clay loam or silt loam overwash

Bg horizon:
Hue—10YR to 5Y
Value—2 to 4
Chroma—1
Texture—silty clay loam

Cg horizon:
Hue—10YR to 5Y
Value—3 to 6
Chroma—1 or 2
Texture—silty clay loam or silt loam

133—Colo silty clay loam, 0 to 2 percent slopes, occasionally flooded

Composition

Colo and similar soils: 100 percent

Setting

Landform: Flood plains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay loam
Depth to bedrock: More than 60 inches
Drainage class: Poorly drained
Dominant parent material: Silty alluvium
Frequency of flooding: Occasional
Water table depth: At the surface to 1 foot below the surface
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 11.9 inches (high)
Content of organic matter in the surface layer: About 6 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

133+—Colo silt loam, 0 to 2 percent slopes, occasionally flooded, overwash

Composition

Colo and similar soils: 100 percent

Setting

Landform: Flood plains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Poorly drained
Dominant parent material: Silty alluvium
Frequency of flooding: Occasional
Water table depth: At the surface to 1 foot below the surface
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 12.0 inches (high)
Content of organic matter in the surface layer: About 4 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available

in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Cooper Series

Drainage class: Somewhat poorly drained
Permeability: Moderate in the upper part and slow in the lower part
Landform: Flood plains (old bottom land)
Parent material: Silty alluvium over clayey alluvium
Native vegetation: Prairie
Slope range: 0 to 2 percent

Typical Pedon

Cooper silty clay loam, 0 to 2 percent slopes, rarely flooded, in a cultivated field; 100 feet south and 115 feet west of the northeast corner of sec. 4, T. 85 N., R. 46 W.; U.S.G.S. Topographic Quadrangle Sloan, Iowa; lat. 42 degrees 12 minutes 38 seconds N. and long. 96 degrees 11 minutes 38 seconds W.

Ap—0 to 7 inches; black (10YR 2/1) silty clay loam; weak fine and very fine granular structure; friable; few fine roots throughout; neutral; abrupt smooth boundary.

A—7 to 12 inches; very dark brown (10YR 2/2) silty clay loam; weak fine subangular blocky structure and weak very fine granular structure; friable; black (10YR 2/1) coatings on faces of peds; few fine roots throughout; neutral; clear smooth boundary.

BA—12 to 18 inches; very dark grayish brown (2.5Y 3/2) silty clay loam; common fine faint dark grayish brown (2.5Y 4/2) redox depletions; weak very fine and fine subangular blocky structure; friable; very dark gray (10YR 3/1) coatings on faces of peds; few fine roots throughout; few faint very dark brown (10YR 2/2) discontinuous organic coatings in root channels and/or pores; neutral; clear wavy boundary.

Bw—18 to 25 inches; dark grayish brown (2.5Y 4/2) and grayish brown (2.5Y 5/2) silty clay loam; common fine distinct yellowish brown (10YR 5/4 and 5/6) redox concentrations; weak very fine and fine subangular blocky structure; friable; very dark grayish brown (2.5Y 3/2) coatings on faces of peds; few fine roots throughout; few distinct very dark brown (10YR 2/2) discontinuous organic coatings in root channels and/or pores; neutral; clear wavy boundary.

2Bg—25 to 31 inches; grayish brown (2.5Y 5/2) silty clay; common fine distinct yellowish brown (10YR 5/4 and 5/6) redox concentrations; weak very fine and fine subangular blocky structure; firm; dark grayish brown (2.5Y 4/2) coatings on faces of peds; few fine roots throughout; slightly alkaline; gradual wavy boundary.

2Bcg—31 to 42 inches; grayish brown (2.5Y 5/2) silty clay; moderate medium prismatic structure parting to moderate fine prismatic; firm; few fine roots throughout; few fine and medium irregular carbonate concretions; slightly effervescent; moderately alkaline; gradual wavy boundary.

2Cg—42 to 60 inches; grayish brown (2.5Y 5/2) silty clay; common fine distinct yellowish brown (10YR 5/4 and 5/6) redox concentrations; massive with evidence of parting along planes of weakness; firm; few fine and medium irregular carbonate concretions; slightly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the solum: 20 to 45 inches
Thickness of the mollic epipedon: 10 to 20 inches
Depth to carbonates: 20 to 40 inches

Ap and A horizons:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silty clay loam

Bw horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2
Texture—silty clay loam

2Bg horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2
Texture—silty clay

2Cg horizon:
Hue—10YR to 5Y
Value—4 to 6
Chroma—2
Texture—silty clay

255—Cooper silty clay loam, 0 to 2 percent slopes, rarely flooded

Composition

Cooper and similar soils: 100 percent

Setting

Landform: Flood plains (old bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay loam
Depth to bedrock: More than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Silty alluvium over clayey alluvium
Frequency of flooding: Rare
Depth to the water table: 1.5 to 2.5 feet
Kind of water table: Perched
Available water capacity to 60 inches or root-limiting layer: About 9.1 inches (high)
Content of organic matter in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

5044—Fluvaquents, frequently flooded

Composition

Fluvaquents: Variable

Component Description

Frequency of flooding: Frequent
Depth to the water table: 3 to 5 feet
Kind of water table: Apparent

Major Uses of the Unit

- These soils are too variable to be rated for specific uses.

5051—Fluvaquents, ponded

Composition

Fluvaquents: Variable

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Very poorly drained
Flooding: None
Water table depth: 1 foot above to 1 foot below the surface
Kind of water table: Apparent
Ponding duration: Long
Available water capacity to 60 inches or root-limiting layer: About 11.7 inches (high)
Content of organic matter in the surface layer: About 5 percent (high)

Major Uses of the Unit

- These soils are too variable to be rated for specific uses.

Forney Series

Drainage class: Poorly drained
Permeability: Very slow
Landform: Flood plains (young bottom land)
Parent material: Clayey alluvium
Native vegetation: Mixed prairie grasses and deciduous trees
Slope range: 0 to 2 percent

Typical Pedon

Forney silty clay, 0 to 2 percent slopes, rarely flooded, in a cultivated field; 290 feet west and 105 feet north of the center of sec. 27, T. 85 N., R. 46 W.; U.S.G.S. Topographic Quadrangle Sloan, Iowa; lat. 42 degrees 8 minutes 37 seconds N. and long. 96 degrees 11 minutes 7 seconds W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) silty clay, dark grayish brown (10YR 4/2) dry; moderate fine angular blocky structure; firm; few very fine and fine roots throughout; slightly alkaline; abrupt smooth boundary.

C—7 to 15 inches; dark grayish brown (2.5Y 4/2) silty clay; common fine faint olive brown (2.5Y 4/4) and few fine distinct brown (7.5YR 4/4) and strong brown (7.5YR 4/6) redox concentrations; moderate fine subangular blocky structure; firm; few very fine and fine roots throughout; common fine and medium rounded carbonate concretions; slightly effervescent; moderately alkaline; clear smooth boundary.

2Ab—15 to 32 inches; black (2.5Y 2/1) silty clay; moderate medium prismatic structure parting to moderate medium angular blocky; firm; few fine roots throughout; slightly alkaline; clear smooth boundary.

2Bgb—32 to 41 inches; dark grayish brown (2.5Y 4/2) silty clay; few fine distinct dark yellowish brown (10YR 4/6) redox concentrations; moderate fine and medium angular blocky structure; firm; very few distinct black (10YR 2/1) discontinuous coatings on faces of peds; slightly alkaline; clear smooth boundary.

2BCb—41 to 49 inches; dark gray (5Y 4/1) silty clay; few fine distinct dark yellowish brown (10YR 4/6) and dark grayish brown (2.5Y 4/2) redox depletions; moderate fine and medium angular blocky structure; firm; slightly alkaline; clear smooth boundary.

2Cg—49 to 60 inches; olive gray (5Y 5/2) silty clay; common fine distinct dark yellowish brown (10YR 4/6) redox concentrations; massive; firm; few distinct very dark grayish brown (2.5Y 3/2) discontinuous black stains on vertical faces of peds; slightly alkaline.

Range in Characteristics

Thickness of the solum: 4 to 10 inches
Depth to carbonates: 36 to 60 inches

Ap or A horizon:
Hue—10YR, 2.5Y, or N
Value—3
Chroma—0 to 2
Texture—silty clay

C horizon:
Hue—2.5Y or 5Y
Value—4 or 5
Chroma—1 or 2
Texture—silty clay

2Ab horizon:
Hue—2.5Y, 5Y, or N
Value—2 or 3
Chroma—0 or 1
Texture—silty clay

2Bgb horizon:
Hue—2.5Y or 5Y
Value—4 or 5
Chroma—1 or 2
Texture—silty clay

2Cg horizon:
Hue—2.5Y or 5Y
Value—4 or 5
Chroma—1 or 2
Texture—silty clay

553—Forney silty clay, 0 to 2 percent slopes, rarely flooded

Composition

Forney and similar soils: 100 percent

Setting

Landform: Flood plains (young bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay
Depth to bedrock: More than 60 inches
Drainage class: Poorly drained
Dominant parent material: Clayey alluvium
Frequency of flooding: Rare
Water table depth: At the surface to 1 foot below the surface
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 7.2 inches (moderate)
Content of organic matter in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Grable Series

Drainage class: Well drained
Permeability: Moderate in the upper part and rapid in the lower part
Landform: Flood plains (bar area and young bottom land)
Parent material: Silty alluvium over sandy alluvium
Native vegetation: Mixed prairie grasses and deciduous trees
Slope range: 0 to 2 percent

Typical Pedon

Grable silt loam, 0 to 2 percent slopes, rarely flooded, in a cultivated field; 1,410 feet south and 1,020 feet west of the northeast corner of sec. 33, T. 85 N., R. 46 W.; U.S.G.S. Topographic Quadrangle Sloan, Iowa; lat. 42 degrees 8 minutes 17 seconds N. and long. 96 degrees 11 minutes 53 seconds W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; few fine roots throughout; strongly effervescent; moderately alkaline; abrupt smooth boundary.
C1—10 to 23 inches; grayish brown (2.5Y 5/2) and dark grayish brown (2.5Y 4/2) very fine sandy loam; massive; friable; few fine roots throughout; strongly effervescent; moderately alkaline; abrupt smooth boundary.
2C2—23 to 60 inches; grayish brown (2.5Y 5/2) fine sand; common fine distinct light olive brown (2.5Y 5/4) redox concentrations; single grained; loose; few fine roots to a depth of 42 inches; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the solum: 6 to 10 inches
Depth to carbonates: 0 to 10 inches

Ap or A horizon:
Hue—10YR or 2.5Y
Value—3
Chroma—1 to 3
Texture—silt loam

C horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2
Texture—silt loam or very fine sandy loam

2C horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2
Texture—fine sand, loamy fine sand, or sand

514—Grable silt loam, 0 to 2 percent slopes, rarely flooded

Composition

Grable and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains (young bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Silty alluvium over sandy alluvium
Frequency of flooding: Rare
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.7 inches (moderate)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Sarpy and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

1514—Grable silt loam, 0 to 2 percent slopes, occasionally flooded

Composition

Grable and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains (bar area)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Silty alluvium over sandy alluvium
Frequency of flooding: Occasional
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.7 inches (moderate)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Sarpy and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Grantcenter Series

Drainage class: Somewhat poorly drained
Permeability: Moderate
Landform: Flood plains (old bottom land)
Parent material: Silty alluvium
Native vegetation: Prairie
Slope range: 0 to 2 percent

Typical Pedon

Grantcenter silty clay loam, 0 to 2 percent slopes, rarely flooded, in a cultivated field; 900 feet west and 2,390 feet north of the southeast corner of sec. 16, T. 85 N., R. 44 W.; U.S.G.S. Topographic Quadrangle Smithland, Iowa; lat. 42 degrees 10 minutes 30 seconds N. and long. 95 degrees 57 minutes 56 seconds W.

Ap—0 to 6 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak very fine and fine granular structure; friable; few very fine roots throughout; slightly acid; abrupt smooth boundary.

A—6 to 14 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; few very fine roots throughout; neutral; clear smooth boundary.

AB—14 to 23 inches; very dark grayish brown (2.5Y 3/2) silty clay loam; black (10YR 2/1) faces of peds; grayish brown (2.5Y 5/2) dry; few fine faint dark yellowish brown (10YR 4/4) redox concentrations; weak very fine and fine subangular blocky structure; friable; few very fine roots throughout; common fine and medium black (10YR 2/1) wormcasts; neutral; gradual smooth boundary.

Bw1—23 to 32 inches; dark grayish brown (2.5Y 4/2) silt loam; very dark grayish brown (2.5Y 3/2) faces of peds; common fine distinct dark yellowish brown (10YR 4/4) and common fine prominent dark brown (7.5YR 3/4) redox concentrations; weak fine and medium subangular blocky structure; friable; few very fine roots throughout; common fine and medium very dark grayish brown (10YR 3/2) wormcasts; neutral; gradual smooth boundary.

Bw2—32 to 44 inches; dark grayish brown (2.5Y 4/2) silt loam; common fine distinct dark yellowish brown (10YR 4/4) and common fine prominent dark brown (7.5YR 3/4) redox concentrations; weak fine and medium subangular blocky structure; friable; few very fine roots throughout; few fine and medium very dark grayish brown (2.5Y 3/2) wormcasts; slightly alkaline; gradual smooth boundary.

Bw3—44 to 50 inches; dark grayish brown (2.5Y 4/2) silt loam; few fine distinct dark yellowish brown (10YR 4/4) and common fine prominent dark brown (7.5YR 3/4) redox concentrations; weak medium subangular blocky structure; friable; few very fine roots throughout; few fine and medium very dark grayish brown (2.5YR 3/2) wormcasts; slightly alkaline; gradual smooth boundary.

BC—50 to 56 inches; dark grayish brown (2.5Y 4/2) and grayish brown (2.5Y 5/2) silt loam; few fine prominent dark brown (7.5YR 3/4) and few fine distinct dark yellowish brown (10YR 4/4) redox concentrations; weak medium subangular blocky structure; friable; few very fine roots throughout; few fine and medium very dark grayish brown (2.5Y 3/2) wormcasts; slightly alkaline; gradual smooth boundary.

C—56 to 80 inches; dark grayish brown (2.5Y 4/2) and grayish brown (2.5Y 5/2), stratified loam and silt loam; few fine prominent dark brown (7.5YR 3/4) and few fine distinct dark yellowish brown (10YR 4/4) redox concentrations; massive; friable; few fine and medium very dark grayish brown (2.5Y 3/2) wormcasts; very slightly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the solum: 30 to 60 inches
Thickness of the mollic epipedon: 10 to 24 inches
Depth to carbonates: 24 to 60 inches

Ap and A horizons:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silty clay loam or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2
Texture—silty clay loam or silt loam

C horizon:
Hue—2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—silt loam or loam

123—Grantcenter silty clay loam, 0 to 2 percent slopes, rarely flooded

Composition

Grantcenter and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains (old bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay loam
Depth to bedrock: More than 80 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Silty alluvium
Frequency of flooding: Rare
Depth to the water table: 2 to 4 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 13.7 inches (high)
Content of organic matter in the surface layer: About 5.5 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Larpenteur and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Hamburg Series

Drainage class: Somewhat excessively drained
Permeability: Moderate
Landform: Uplands
Geomorphic component: Head slopes, nose slopes, side slopes, and interfluves
Parent material: Calcareous loess
Native vegetation: Prairie
Slope range: 40 to 75 percent

Typical Pedon

Hamburg silt loam, 40 to 75 percent slopes, 2,100 feet south and 2,100 feet east of the northwest corner of sec. 20, T. 84 N., R. 44 W.; U.S.G.S. Topographic Quadrangle Castana, Iowa; lat. 42 degrees 4 minutes 27 seconds N. and long. 95 degrees 59 minutes 37 seconds W.

A—0 to 4 inches; dark grayish brown (10YR 4/2) silt loam, grayish brown (10YR 5/2) dry; weak fine and very fine granular structure; friable; many fine roots throughout; strongly effervescent; slightly alkaline; clear smooth boundary.

AC—4 to 8 inches; brown (10YR 4/3) silt loam; dark grayish brown (10YR 4/2) faces of peds; weak fine granular structure; friable; few fine roots throughout; few faint very dark grayish brown (10YR 3/2) discontinuous organic coatings in root channels and/or pores; strongly effervescent; slightly alkaline; gradual smooth boundary.

C1—8 to 18 inches; brown (10YR 5/3) silt loam; massive; friable; few fine roots throughout and few very fine roots throughout; very few faint dark brown (10YR 3/3) discontinuous organic coatings

in root channels and/or pores; strongly effervescent; slightly alkaline; diffuse smooth boundary.

C2—18 to 60 inches; brown (10YR 5/3) silt loam; few fine faint light brownish gray (10YR 6/2) redox depletions and few fine distinct strong brown (7.5YR 5/6) redox concentrations; massive; friable; few fine roots throughout; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the solum: 0 to 10 inches
Depth to carbonates: 0 to 6 inches

A horizon:
Hue—10YR
Value—3 or 4
Chroma—2 or 3
Texture—silt loam

C horizon:
Hue—10YR
Value—4 to 6
Chroma—3 or 4
Texture—silt loam or silt

2G—Hamburg silt loam, 40 to 75 percent slopes

Composition

Hamburg and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands
Geomorphic component: Interfluves, head slopes, nose slopes, and side slopes
Hillslope position: Narrow summits and backslopes
Slope range: 40 to 75 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Somewhat excessively drained
Dominant parent material: Calcareous loess
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.8 inches (high)
Content of organic matter in the surface layer: About 1.25 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Steinauer and similar soils

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Haynie Series

Drainage class: Well drained
Permeability: Moderate
Landform: Flood plains (bar area and young bottom land)
Parent material: Calcareous alluvium
Native vegetation: Mixed prairie grasses and deciduous trees
Slope range: 0 to 2 percent

Typical Pedon

Haynie silt loam, 0 to 2 percent slopes, rarely flooded, 790 feet west and 1,420 feet north of the center of sec. 34, T. 85 N., R. 46 W.; U.S.G.S. Topographic Quadrangle Sloan, Iowa; lat. 42 degrees 8 minutes 20 seconds N. and long. 96 degrees 11 minutes 15 seconds W.

Ap—0 to 7 inches; very dark brown (10YR 3/2) silt loam, grayish brown (2.5Y 5/2) dry; small clods parting to weak fine subangular blocky structure and weak fine granular structure; some evidence of horizontal cleavage and stratification of lighter colors in the lower part; very friable; few very dark brown (10YR 3/3) spots of decomposed organic materials; slightly effervescent; slightly alkaline; clear smooth boundary.

C—7 to 60 inches; stratified dark grayish brown (10YR 4/2 and 2.5Y 4/2) and grayish brown (10YR 5/2 and 2.5Y 5/2) silt loam, light brownish gray (2.5Y 6/2) dry; common fine faint gray (5Y 5/1) and few fine distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) redox concentrations; no redox concentrations in some strata; some horizontal cleavage; common lenses of very fine sandy loam $^1/_8$ to $^1/_4$ inch thick; a lens of very fine

sandy loam at a depth of 10 to 13 inches; very friable; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the solum: 6 to 10 inches
Depth to carbonates: 0 to 10 inches

Ap or A horizon:
Hue—10YR or 2.5Y
Value—3
Chroma—2
Texture—silt loam

C horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—3 to 5
Texture—silt loam or very fine sandy loam

137—Haynie silt loam, 0 to 2 percent slopes, rarely flooded

Composition

Haynie and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains (young bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Calcareous alluvium
Frequency of flooding: Rare
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.3 inches (high)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Sarpy and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section
- “Forest Land” section

1137—Haynie silt loam, 0 to 2 percent slopes, occasionally flooded

Composition

Haynie and similar soils: 100 percent

Setting

Landform: Flood plains (bar area)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Calcareous alluvium
Frequency of flooding: Occasional
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.3 inches (high)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Hornick Series

Drainage class: Somewhat poorly drained
Permeability: Slow
Landform: Flood plains (young bottom land)

Parent material: Clayey alluvium over silty alluvium
Native vegetation: Prairie
Slope range: 0 to 2 percent

Typical Pedon

Hornick silty clay, 0 to 2 percent slopes, rarely flooded, in a cultivated field; 800 feet north and 1,390 feet west of the southeast corner of sec. 15, T. 83 N., R. 45 W.; U.S.G.S. Topographic Quadrangle Blencoe, Iowa; lat. 41 degrees 59 minutes 46 seconds N. and long. 96 degrees 3 minutes 51 seconds W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silty clay, gray (10YR 5/1) dry; weak fine granular structure; firm; few fine roots throughout; few fine tubular pores; neutral; abrupt smooth boundary.

A—9 to 14 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; few fine distinct dark yellowish brown (10YR 4/4) redox concentrations; weak fine granular structure; friable; few fine roots throughout; few fine and medium tubular pores; neutral; clear smooth boundary.

AB—14 to 19 inches; very dark grayish brown (10YR 3/2) and dark grayish brown (2.5Y 4/2) silt loam; few fine distinct dark yellowish brown (10YR 4/4) redox concentrations; weak fine subangular blocky structure; friable; few fine roots throughout; few fine and medium tubular pores; slightly alkaline; clear smooth boundary.

Bw1—19 to 30 inches; dark grayish brown (2.5Y 4/2) silt loam; few fine distinct gray (10YR 6/1) redox depletions and dark yellowish brown (10YR 4/4) redox concentrations; weak fine and medium subangular blocky structure; friable; few fine and medium roots throughout; few fine and medium tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Bw2—30 to 37 inches; grayish brown (2.5Y 5/2) silt loam; few fine distinct gray (10YR 6/1) redox depletions and dark yellowish brown (10YR 4/4) redox concentrations; weak medium subangular blocky structure; friable; few fine roots throughout; few fine tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

2Bw3—37 to 58 inches; grayish brown (2.5Y 5/2) silty clay; common fine distinct gray (10YR 6/1) redox depletions and dark yellowish brown (10YR 4/4) redox concentrations; weak fine and medium prismatic structure parting to weak fine and medium angular blocky; firm; few fine roots throughout; few fine and medium irregular carbonate concretions; strongly effervescent; moderately alkaline; gradual smooth boundary.

2Bk—58 to 68 inches; dark grayish brown (2.5Y 4/2) silty clay; common fine distinct gray (10YR 6/1) redox depletions and dark yellowish brown (10YR 4/4) redox concentrations; weak medium prismatic structure parting to weak medium angular blocky; firm; few fine irregular carbonate concretions; strongly effervescent; moderately alkaline; gradual smooth boundary.

2C—68 to 80 inches; dark grayish brown (2.5Y 4/2) silty clay; common fine distinct gray (10YR 6/1) redox depletions and dark yellowish brown (10YR 4/4) redox concentrations; massive with evidence of parting along planes of weakness; firm; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the solum: 30 to 60 inches
Thickness of the mollic epipedon: 10 to 24 inches
Depth to carbonates: 15 to 40 inches

Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silty clay

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam

Bw horizon:
Hue—2.5Y or 10YR
Value—3 to 5
Chroma—1 or 2
Texture—silt loam

2Bw horizon:
Hue—2.5Y
Value—4 or 5
Chroma—2
Texture—silty clay

2C horizon:
Hue—2.5Y
Value—4 or 5
Chroma—2
Texture—silty clay

748—Hornick silty clay, 0 to 2 percent slopes, rarely flooded

Composition

Hornick and similar soils: 100 percent

Setting

Landform: Flood plains (young bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay
Depth to bedrock: More than 80 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Clayey alluvium over silty alluvium
Frequency of flooding: Rare
Depth to the water table: 2 to 4 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 9.5 inches (high)
Content of organic matter in the surface layer: About 5 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Ida Series

Drainage class: Well drained
Permeability: Moderate
Landform: Uplands
Geomorphic component: Head slopes, nose slopes, side slopes, and interfluves
Parent material: Calcareous loess
Native vegetation: Prairie
Slope range: 5 to 40 percent

Typical Pedon

Ida silt loam, 14 to 20 percent slopes, in a pasture; 1,600 feet south and 200 feet east of the northwest corner of sec. 3, T. 85 N., R. 43 W.; U.S.G.S. Topographic Quadrangle Mapleton, Iowa; lat. 42 degrees 12 minutes 26 seconds N. and long. 95 degrees 50 minutes 40 seconds W.

Ap—0 to 8 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak fine subangular blocky structure parting to weak fine granular; friable; few very fine roots throughout; slightly effervescent; slightly alkaline; abrupt smooth boundary.

C1—8 to 28 inches; dark yellowish brown (10YR 4/4) silt loam; few fine distinct strong brown (7.5YR 4/6) and grayish brown (10YR 5/2) relict redox depletions; massive with evidence of parting along planes of weakness; friable; few fine roots throughout; strongly effervescent; slightly alkaline; clear smooth boundary.

C2—28 to 60 inches; dark yellowish brown (10YR 4/4) silt loam; common fine distinct strong brown (7.5YR 4/6) and grayish brown (10YR 5/2) relict redox depletions; massive with evidence of horizontal cleavage; very few distinct brown (7.5YR 4/4) continuous organic coatings on vertical and horizontal faces of cleavage planes; common fine and medium irregular soft masses of carbonate; slightly alkaline.

Range in Characteristics

Thickness of the solum: 6 to 10 inches
Depth to carbonates: 0 to 10 inches

Ap or A horizon:
Hue—10YR
Value—3 to 5
Chroma—2 or 3
Texture—silt loam

C horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—3 to 6
Texture—silt loam

1C—Ida silt loam, 5 to 9 percent slopes

Composition

Ida and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Uplands

Geomorphic component: Interfluves, head slopes, nose slopes, and side slopes
Hillslope position: Shoulders and summits
Slope range: 5 to 9 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Calcareous loess
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.6 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Monona and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section

1C3—Ida silt loam, 5 to 9 percent slopes, severely eroded

Composition

Ida and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Uplands
Geomorphic component: Interfluves, head slopes, nose slopes, and side slopes
Hillslope position: Shoulders and summits
Slope range: 5 to 9 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Calcareous loess
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.6 inches (high)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Monona and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section

1D—Ida silt loam, 9 to 14 percent slopes

Composition

Ida and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Shoulders and backslopes
Slope range: 9 to 14 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Calcareous loess
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.6 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this

section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Monona and similar soils
- Napier and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

1D3—Ida silt loam, 9 to 14 percent slopes, severely eroded

Composition

Ida and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Shoulders and backslopes
Slope range: 9 to 14 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Calcareous loess
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.6 inches (high)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Monona and similar soils
- Napier and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

1E—Ida silt loam, 14 to 20 percent slopes

Composition

Ida and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Backslopes
Slope range: 14 to 20 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Calcareous loess
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.6 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Monona and similar soils
- Napier and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

1E3—Ida silt loam, 14 to 20 percent slopes, severely eroded

Composition

Ida and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Backslopes
Slope range: 14 to 20 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Calcareous loess
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.6 inches (high)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Monona and similar soils
- Napier and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

1F—Ida silt loam, 20 to 30 percent slopes

Composition

Ida and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slope, side slopes, and interfluves
Hillslope position: Backslopes and narrow summits
Slope range: 20 to 30 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Calcareous loess
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.6 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Steinauer and similar soils
- Monona and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

1F3—Ida silt loam, 20 to 30 percent slopes, severely eroded

Composition

Ida and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, side slopes, and interfluves
Hillslope position: Backslopes and narrow summits
Slope range: 20 to 30 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Calcareous loess
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.6 inches (high)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Steinauer and similar soils
- Monona and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

1G—Ida silt loam, 30 to 40 percent slopes

Composition

Ida and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, side slopes, and interfluves
Hillslope position: Backslopes and narrow summits
Slope range: 30 to 40 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Calcareous loess
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.6 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Steinauer and similar soils
- Monona and similar soils

Major Uses of the Unit

- Cropland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Keg Series

Drainage class: Well drained
Permeability: Moderate
Landform: Flood plains (old bottom land)
Parent material: Silty alluvium
Native vegetation: Prairie
Slope range: 0 to 2 percent

Typical Pedon

Keg silt loam, 0 to 2 percent slopes, rarely flooded, in a pasture; 2,640 feet east and 255 feet south of the center of sec. 24, T. 85 N., R. 46 W.; U.S.G.S. Topographic Quadrangle Sloan, Iowa; lat. 42 degrees 05 minutes 45 seconds N. and long. 96 degrees 08 minutes 09 seconds W.

Ap—0 to 7 inches; black (10YR 2/1) silt loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; few fine roots throughout; neutral; abrupt smooth boundary.

A—7 to 17 inches; very dark gray (10YR 3/1) silt loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; few fine roots throughout; neutral; clear smooth boundary.

Bw—17 to 28 inches; brown (10YR 4/3) silt loam; few fine faint dark yellowish brown (10YR 4/6) redox concentrations; weak fine subangular blocky structure parting to weak very fine subangular

blocky; friable; few fine and very fine roots throughout; neutral; gradual smooth boundary.

BC—28 to 36 inches; dark yellowish brown (10YR 4/4) silt loam; common fine faint dark yellowish brown (10YR 4/6) redox concentrations; weak fine subangular blocky structure; friable; few very fine roots; slightly effervescent; slightly alkaline; gradual smooth boundary.

C—36 to 60 inches; light olive brown (2.5Y 5/4) silt loam; massive; friable; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the solum: 24 to 42 inches
Thickness of the mollic epipedon: 10 to 18 inches
Depth to carbonates: 24 to 40 inches

Ap and A horizons:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—silt loam

C horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—silt loam or very fine sandy loam

46—Keg silt loam, 0 to 2 percent slopes, rarely flooded

Composition

Keg and similar soils: 100 percent

Setting

Landform: Flood plains (old bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Silty alluvium
Frequency of flooding: Rare
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.8 inches (high)
Content of organic matter in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Kenmoor Series

Drainage class: Moderately well drained
Permeability: Rapid in the upper part and slow in the lower part
Landform: Flood plains (bar area)
Parent material: Sandy alluvium over clayey alluvium
Native vegetation: Mixed prairie grasses and deciduous trees
Slope range: 0 to 2 percent

Typical Pedon

Kenmoor fine sandy loam, 0 to 2 percent slopes, occasionally flooded, 700 feet west and 200 feet south of the center of sec. 18, T. 82 N., R. 45 W.; U.S.G.S. Topographic Quadrangle Tekamah NW, Iowa; lat. 41 degrees 54 minutes 58 seconds N. and long. 96 degrees 7 minutes 47 seconds W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) fine sandy loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; many fine and medium roots throughout; slightly effervescent; neutral; abrupt smooth boundary.

C1—7 to 23 inches; grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) loamy fine sand; few fine distinct strong brown (7.5YR 5/6) redox concentrations; massive with evidence of horizontal parting; very friable; common fine roots throughout; few fine rounded dark nodules; strongly effervescent; slightly alkaline; clear smooth boundary.

C2—23 to 33 inches; grayish brown (10YR 5/2) loamy fine sand; common fine and medium distinct strong brown (7.5YR 5/6) redox concentrations;

massive; very friable; few fine roots throughout; few faint dark brown (10YR 3/3) discontinuous coatings; strongly effervescent; moderately alkaline; clear wavy boundary.

2Ab—33 to 60 inches; very dark grayish brown (2.5Y 3/2) and dark grayish brown (2.5Y 4/2) silty clay; massive or weak fine angular blocky structure; very firm; slightly alkaline.

Range in Characteristics

Combined thickness of the A and C horizons: 20 to 38 inches
Thickness of the solum: 4 to 10 inches
Depth to carbonates: 0 to 10 inches

Ap or A horizon:
Hue—10YR
Value—3 to 5
Chroma—2 to 4
Texture—loamy fine sand or fine sandy loam

C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 or 3
Texture—loamy fine sand or fine sand

2Ab horizon:
Hue—2.5Y or 5Y
Value—3 to 5
Chroma—2 to 4
Texture—silty clay

1849—Kenmoor fine sandy loam, 0 to 2 percent slopes, occasionally flooded

Composition

Kenmoor and similar soils: 100 percent

Setting

Landform: Flood plains (bar area)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Fine sandy loam
Depth to bedrock: More than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Sandy alluvium over clayey alluvium
Frequency of flooding: Occasional
Depth to the water table: 2 to 3 feet
Kind of water table: Perched
Available water capacity to 60 inches or root-limiting layer: About 7.4 inches (moderate)
Content of organic matter in the surface layer: About 0.75 percent (low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section
- “Forest Land” section

Kennebec Series

Drainage class: Moderately well drained
Permeability: Moderate
Landform: Flood plains
Parent material: Silty alluvium
Native vegetation: Prairie
Slope range: 0 to 2 percent

Typical Pedon

Kennebec silt loam, 0 to 2 percent slopes, occasionally flooded, in a cultivated field; 910 feet east and 60 feet south of the northwest corner of sec. 9, T. 84 N., R. 43 W.; U.S.G.S. Topographic Quadrangle Mapleton SE, Iowa; lat. 42 degrees 06 minutes 37 seconds N. and long. 95 degrees 51 minutes 00 seconds W.

Ap—0 to 7 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; few very fine roots throughout; few fine discontinuous tubular pores; neutral; abrupt smooth boundary.

A1—7 to 14 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; weak very fine and fine granular structure; friable; few very fine roots throughout; many fine continuous tubular pores; neutral; clear smooth boundary.

A2—14 to 26 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; weak very fine and fine granular structure; friable; few very fine roots throughout; many fine continuous tubular pores; few fine rounded wormcasts; neutral; gradual smooth boundary.

A3—26 to 36 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky and weak fine granular structure; friable; few very fine roots throughout; many fine continuous tubular pores; few fine rounded wormcasts; neutral; gradual smooth boundary.

A4—36 to 48 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; weak very fine and fine subangular blocky structure; friable; few very fine roots throughout; many fine continuous tubular pores; few fine rounded wormcasts; neutral; gradual smooth boundary.

AC—48 to 60 inches; very dark grayish brown (10YR 3/2) silt loam; weak very fine and fine subangular blocky structure; friable; very dark gray (10YR 3/1) coatings on faces of peds; many fine continuous tubular pores; few fine rounded wormcasts; neutral; gradual smooth boundary.

C—60 to 72 inches; dark grayish brown (10YR 4/2) and very dark grayish brown (10YR 3/2) silt loam; few fine faint dark yellowish brown (10YR 4/4) redox concentrations; massive; friable; many fine continuous tubular pores; few fine rounded wormcasts; neutral.

Range in Characteristics

Thickness of the solum: 36 to 60 inches
Thickness of the mollic epipedon: 36 to 60 inches
Depth to carbonates: 40 to 60 inches

Ap and A horizons:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam

C horizon:
Hue—10YR or 2.5Y
Value—3 or 4
Chroma—1 or 2
Texture—silt loam

212—Kennebec silt loam, 0 to 2 percent slopes, occasionally flooded

Composition

Kennebec and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flood plains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 72 inches
Drainage class: Moderately well drained
Dominant parent material: Silty alluvium
Frequency of flooding: Occasional
Depth to the water table: 3 to 5 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 13.6 inches (high)
Content of organic matter in the surface layer: About 5.5 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Rawles and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section
- “Forest Land” section

212+—Kennebec silt loam, 0 to 2 percent slopes, occasionally flooded, overwash

Composition

Kennebec and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 72 inches
Drainage class: Moderately well drained
Dominant parent material: Silty alluvium
Frequency of flooding: Occasional

Depth to the water table: 3 to 5 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 13.0 inches (high)
Content of organic matter in the surface layer: About 5.5 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- McPaul and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section
- “Forest Land” section

Lakeport Series

Drainage class: Somewhat poorly drained
Permeability: Moderate
Landform: Flood plains (old bottom land)
Parent material: Clayey alluvium
Native vegetation: Prairie
Slope range: 0 to 2 percent

Typical Pedon

Lakeport silty clay loam, 0 to 2 percent slopes, rarely flooded, 1,350 feet north and 100 feet west of the southeast corner of sec. 1, T. 84 N., R. 46 W.; U.S.G.S. Topographic Quadrangle Onawa SW, Iowa; lat. 42 degrees 06 minutes 55 seconds N. and long. 96 degrees 08 minutes 01 second W.

Ap—0 to 10 inches; black (10YR 2/1) silty clay loam, very dark grayish brown (10YR 3/2) dry; weak fine subangular blocky and weak fine granular structure; firm; few fine roots throughout; neutral; abrupt smooth boundary.

A—10 to 22 inches; very dark gray (10YR 3/1) silty clay loam, very dark grayish brown (10YR 3/2) dry; few fine distinct brown (7.5YR 4/4) redox concentrations; weak fine subangular blocky structure; friable; few fine roots throughout; neutral; gradual smooth boundary.

BA—22 to 26 inches; dark grayish brown (10YR 4/2) silty clay loam; few fine distinct brown (7.5YR 4/4) redox concentrations; weak fine subangular blocky structure; friable; few fine roots throughout; very few faint very dark gray (10YR 3/1) discontinuous organic coatings on faces of peds; neutral; gradual smooth boundary.

Bw1—26 to 38 inches; dark grayish brown (2.5Y 4/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) redox concentrations; weak medium subangular blocky structure; friable; few fine roots throughout; few distinct very dark gray (10YR 3/1) discontinuous organic coatings on faces of peds; neutral; gradual smooth boundary.

Bw2—38 to 47 inches; olive brown (2.5Y 4/4) and dark grayish brown (2.5Y 4/2) silty clay loam; common fine yellowish brown (10YR 5/6) redox concentrations; moderate medium subangular blocky structure; friable; few fine and medium rounded carbonate nodules; slightly effervescent; neutral; gradual smooth boundary.

C—47 to 60 inches; grayish brown (2.5Y 5/2) silt loam; many medium distinct yellowish brown (10YR 5/6) redox concentrations; massive; friable; violently effervescent; slightly alkaline.

Range in Characteristics

Thickness of the solum: 40 to 55 inches
Thickness of the mollic epipedon: 16 to 24 inches
Depth to carbonates: 36 to 60 inches

Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silty clay loam

A horizon:
Hue—10YR or 2.5Y
Value—2 or 3
Chroma—1 or 2
Texture—silty clay loam

Bw1 horizon:
Hue—10YR or 2.5Y
Value—3 or 4
Chroma—1 or 2
Texture—silty clay loam or silty clay

Bw2 horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 to 4
Texture—silty clay loam or silty clay

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 6
Chroma—1 to 4
Texture—silt loam

436—Lakeport silty clay loam, 0 to 2 percent slopes, rarely flooded

Composition

Lakeport and similar soils: 100 percent

Setting

Landform: Flood plains (old bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay loam
Depth to bedrock: More than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Clayey alluvium
Frequency of flooding: Rare
Depth to the water table: 2 to 4 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 11.1 inches (high)
Content of organic matter in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Larpenteur Series

Drainage class: Somewhat poorly drained
Permeability: Moderate
Landform: Flood plains (old bottom land)
Parent material: Silty alluvium
Native vegetation: Prairie
Slope range: 0 to 2 percent

Typical Pedon

Larpenteur silt loam, 0 to 2 percent slopes, rarely flooded, in a cultivated field; 900 feet west and 1,500 feet north of the southeast corner of sec. 13, T. 85 N., R. 45 W.; U.S.G.S. Topographic Quadrangle Hornick, Iowa; lat. 42 degrees 10 minutes 21 seconds N. and long. 96 degrees 01 minute 31 seconds W.

Ap—0 to 8 inches; black (10YR 2/1) silt loam, very dark grayish brown (10YR 3/2) dry; weak fine granular structure; friable; few fine roots throughout; slightly effervescent; slightly alkaline; abrupt smooth boundary.

A—8 to 14 inches; very dark grayish brown (2.5Y 3/2) and dark brown (10YR 3/3) silt loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; friable; few fine roots throughout; violently effervescent; moderately alkaline; gradual smooth boundary.

Bw1—14 to 20 inches; dark grayish brown (2.5Y 4/2) silt loam; weak medium subangular blocky structure; friable; few fine roots throughout; violently effervescent; moderately alkaline; gradual smooth boundary.

Bw2—20 to 36 inches; olive brown (2.5Y 4/4) silt loam; few fine faint light olive brown (2.5Y 5/6) redox concentrations; weak medium subangular blocky structure; friable; few fine roots throughout; very few distinct strong brown (7.5YR 4/6) discontinuous iron stains on faces of peds; few fine and medium rounded carbonate nodules and few fine rounded carbonate concretions; violently effervescent; moderately alkaline; gradual smooth boundary.

C—36 to 60 inches; grayish brown (2.5Y 5/2) silt loam; few fine distinct yellowish brown (10YR 5/6) redox concentrations; massive; friable; very few distinct very dark grayish brown (10YR 3/2) discontinuous iron stains on faces of peds; violently effervescent; moderately alkaline.

Range in Characteristics

Thickness of the solum: 30 to 54 inches
Thickness of the mollic epipedon: 10 to 24 inches
Depth to carbonates: 0 to 10 inches

Ap and A horizons:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam or silty clay loam

Bw horizon:
Hue—10YR or 2.5Y
Value—4 or 5

Chroma—2 to 4
Texture—silt loam or silty clay loam

C horizon:
Hue—2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—silt loam

754—Larpenteur silt loam, 0 to 2 percent slopes, rarely flooded

Composition

Larpenteur and similar soils: 100 percent

Setting

Landform: Flood plains (old bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Silty alluvium
Frequency of flooding: Rare
Depth to the water table: 2 to 4 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 12.5 inches (high)
Content of organic matter in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Lossing Series

Drainage class: Somewhat poorly drained
Permeability: Slow
Landform: Flood plains (bar area and young bottom land)
Parent material: Clayey alluvium over silty alluvium
Native vegetation: Mixed prairie grasses and deciduous trees
Slope range: 0 to 2 percent

Typical Pedon

Lossing silty clay, 0 to 2 percent slopes, rarely flooded, 1,120 feet east and 90 feet south of the northwest corner of sec. 18, T. 84 N., R. 46 W.; U.S.G.S. Topographic Quadrangle Onawa SW, Iowa; lat. 42 degrees 05 minutes 54 seconds N. and long. 96 degrees 14 minutes 54 seconds W.

Ap—0 to 6 inches; very dark grayish brown (2.5Y 3/2) silty clay, dark grayish brown (2.5Y 4/2) dry; moderate fine granular structure parting to moderate fine subangular blocky; firm; few fine roots throughout; slightly alkaline; abrupt smooth boundary.

Bg—6 to 10 inches; dark grayish brown (2.5Y 4/2) silty clay; moderate fine and medium subangular blocky structure; firm; few fine roots throughout; slightly effervescent; moderately alkaline; clear smooth boundary.

Cg1—10 to 14 inches; dark grayish brown (2.5Y 4/2) silty clay loam; few fine faint grayish brown (10YR 5/2) and prominent brown (7.5YR 4/4) redox concentrations; massive with evidence of horizontal parting; very friable; few fine roots throughout; very few faint dark brown (10YR 3/3) patchy coatings on horizontal faces of cleavage planes; strongly effervescent; moderately alkaline; clear wavy boundary.

2Cg2—14 to 47 inches; grayish brown (2.5Y 5/2) and light olive brown (2.5Y 5/4) silt loam; few fine faint grayish brown (10YR 5/2) and prominent brown (7.5YR 4/4) redox concentrations; massive with evidence of horizontal parting; very friable; few fine roots throughout; very few faint dark brown (10YR 3/3) patchy coatings on horizontal faces of cleavage planes; strongly effervescent; moderately alkaline; clear wavy boundary.

2Cg3—47 to 71 inches; dark grayish brown (2.5Y 4/2) silt loam; few fine prominent grayish brown (10YR 5/2) and brown (7.5YR 4/4) redox concentrations; massive with evidence of horizontal parting; very friable; few fine roots throughout; very few faint dark brown (10YR 3/3) patchy coatings on horizontal faces of cleavage planes; strongly effervescent; moderately alkaline; clear wavy boundary.

2Cg4—71 to 80 inches; dark grayish brown (2.5Y 4/2) fine sandy loam; massive; very friable; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the solum: 6 to 10 inches
Depth to carbonates: 0 to 10 inches

Ap or A horizon:
Hue—10YR or 2.5Y
Value—2 or 3
Chroma—1 or 2
Texture—silty clay

Bg horizon:
Hue—10YR or 2.5Y
Value—3 or 4
Chroma—2
Texture—silty clay

Cg horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—silty clay loam

2Cg horizon:
Hue—2.5Y
Value—4 to 6
Chroma—2
Texture—silt loam

746—Lossing silty clay, 0 to 2 percent slopes, rarely flooded

Composition

Lossing and similar soils: 100 percent

Setting

Landform: Flood plains (young bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay
Depth to bedrock: More than 80 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Clayey alluvium over silty alluvium
Frequency of flooding: Rare
Depth to the water table: 2 to 4 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 11.8 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

1746—Lossing silty clay, 0 to 2 percent slopes, occasionally flooded

Composition

Lossing and similar soils: 100 percent

Setting

Landform: Flood plains (bar area)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay
Depth to bedrock: More than 80 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Clayey alluvium over silty alluvium
Frequency of flooding: Occasional
Depth to the water table: 2 to 4 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 11.8 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Luton Series

Drainage class: Poorly drained
Permeability: Very slow
Landform: Flood plains (old bottom land)
Parent material: Clayey alluvium
Native vegetation: Prairie
Slope range: 0 to 2 percent

Typical Pedon

Luton silty clay, 0 to 1 percent slopes, rarely flooded, in a cultivated field; 2,445 feet north and 190 feet west of the southeast corner of sec. 1, T. 85 N., R. 46 W.; U.S.G.S. Topographic Quadrangle Sloan, Iowa; lat. 42 degrees 12 minutes 22 seconds N. and long. 96 degrees 08 minutes 09 seconds W.

Ap—0 to 6 inches; black (10YR 2/1) silty clay; moderate very fine angular blocky and moderate very fine granular structure; firm; few fine roots throughout; neutral; abrupt smooth boundary.

A1—6 to 14 inches; black (10YR 2/1) silty clay; few fine distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) redox concentrations; moderate fine subangular blocky and moderate fine granular structure; firm; few fine roots throughout; neutral; clear smooth boundary.

A2—14 to 22 inches; black (10YR 2/1) silty clay; common fine distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) redox concentrations; moderate fine and very fine subangular blocky structure; firm; few fine roots throughout; slightly alkaline; clear wavy boundary.

A3—22 to 30 inches; very dark gray (5Y 3/1) silty clay; common fine distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) redox concentrations; moderate medium and fine subangular blocky structure; firm; few fine roots throughout; slightly alkaline; clear wavy boundary.

Bg1—30 to 35 inches; dark gray (5Y 4/1) and very dark gray (5Y 3/1) silty clay; common fine distinct dark yellowish brown (10YR 4/4), distinct brown (10YR 5/3), and faint gray (5Y 5/1) redox depletions; moderate medium and fine subangular blocky structure; firm; few fine roots throughout; slightly alkaline; clear wavy boundary.

Bg2—35 to 44 inches; gray (5Y 5/1) silty clay; common fine distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) redox concentrations; moderate medium and fine prismatic structure; firm; 45-degree pressure faces on faces of peds; very few fine rounded masses of gypsum; slightly alkaline; gradual wavy boundary.

Bg3—44 to 50 inches; gray (5Y 5/1) silty clay; common fine distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) redox concentrations; weak medium and fine prismatic structure; firm; few snail-shell fragments 1 to 3 mm in size; 45-degree pressure faces within prismatic structure; few fine rounded soft masses of carbonate and few fine rounded soft masses of iron-manganese; slightly effervescent; slightly alkaline; gradual wavy boundary.

Cg—50 to 78 inches; gray (5Y 5/1) silty clay; many fine distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) redox concentrations; weak medium prismatic structure; firm; 45-degree pressure faces on faces of peds; few fine and medium irregular carbonate concretions; slightly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the solum: 36 to 60 inches
Thickness of the mollic epipedon: 24 to 32 inches
Depth to carbonates: 36 to 60 inches

Ap and A horizons:
Hue—10YR or N
Value—2 or 3
Chroma—0 or 1
Texture—silty clay or silty clay loam

Bg horizon (upper part):
Hue—5Y
Value—3
Chroma—1 or 2
Texture—silty clay

Bg horizon (lower part):
Hue—5Y
Value—4 or 5
Chroma—1 or 2
Texture—silty clay

Cg horizon:
Hue—5Y
Value—4 or 5
Chroma—1 or 2
Texture—silty clay

66—Luton silty clay, 0 to 1 percent slopes, rarely flooded

Composition

Luton and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains (old bottom land)
Slope range: 0 to 1 percent

Component Description

Texture of the surface layer: Silty clay
Depth to bedrock: More than 78 inches
Drainage class: Poorly drained
Dominant parent material: Clayey alluvium
Frequency of flooding: Rare
Water table depth: At the surface to 1 foot below the surface
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 7.5 inches (moderate)
Content of organic matter in the surface layer: About 4 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Napa and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

66+—Luton silt loam, 0 to 1 percent slopes, rarely flooded, overwash

Composition

Luton and similar soils: 100 percent

Setting

Landform: Flood plains (old bottom land)
Slope range: 0 to 1 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 78 inches
Drainage class: Poorly drained
Dominant parent material: Clayey alluvium
Frequency of flooding: Rare
Water table depth: At the surface to 1 foot below the surface
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 8.3 inches (moderate)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

366—Luton silty clay loam, 0 to 1 percent slopes, rarely flooded

Composition

Luton and similar soils: 100 percent

Setting

Landform: Flood plains (old bottom land)
Slope range: 0 to 1 percent

Component Description

Texture of the surface layer: Silty clay loam
Depth to bedrock: More than 78 inches
Drainage class: Poorly drained
Dominant parent material: Clayey alluvium
Frequency of flooding: Rare
Water table depth: At the surface to 1 foot below the surface
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 8.7 inches (moderate)
Content of organic matter in the surface layer: About 4 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland

- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

McPaul Series

Drainage class: Moderately well drained
Permeability: Moderate
Landform: Flood plains (old bottom land)
Parent material: Calcareous alluvium
Native vegetation: Prairie grasses
Slope range: 0 to 2 percent

Typical Pedon

McPaul silt loam, 0 to 2 percent slopes, rarely flooded, in a cultivated field; 1,290 feet west and 2,540 feet north of the southeast corner of sec. 9, T. 85 N., R. 44 W.; U.S.G.S. Topographic Quadrangle Smithland, Iowa; lat. 42 degrees 11 minutes 24 seconds N. and long. 95 degrees 58 minutes 01 second W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; weak fine and very fine granular structure; friable; few very fine and fine roots throughout; slightly effervescent; slightly alkaline; abrupt smooth boundary.

C1—8 to 30 inches; stratified dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) silt loam; common fine distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) redox concentrations and few fine distinct brown (7.5YR 4/4) redox concentrations; massive with evidence of parting along planes of weakness; friable; few very fine and fine roots throughout; strongly effervescent; slightly alkaline; gradual smooth boundary.

C2—30 to 60 inches; stratified dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) silt loam; few fine distinct dark yellowish brown (10YR 4/4), yellowish brown (10YR 5/4), and brown (7.5YR 4/4) redox concentrations; massive with evidence of parting along planes of weakness; friable; strongly effervescent; slightly alkaline.

Range in Characteristics

Combined thickness of the A and C horizons: 40 or more inches
Thickness of the solum: 6 to 10 inches

Ap or A horizon:
Hue—10YR
Value—3
Chroma—2
Texture—silt loam

C horizon:
Hue—10YR
Value—4 or 5
Chroma—2 or 3
Texture—silt loam

70—McPaul silt loam, 0 to 2 percent slopes, rarely flooded

Composition

McPaul and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains (old bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Calcareous alluvium
Frequency of flooding: Rare
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 13.2 inches (high)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Kennebec and similar soils

Major Uses of the Unit

- Cropland (fig. 11)
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Figure 11.—A cultivated area of McPaul silt loam, 0 to 2 percent slopes, rarely flooded. Hamburg and Ida soils are on the steep bluffs in the background.

Modale Series

Drainage class: Somewhat poorly drained
Permeability: Moderate in the upper part and slow in the lower part
Landform: Flood-plain splays; flood plains (bar area and young bottom land)
Parent material: Silty alluvium over clayey alluvium
Native vegetation: Mixed prairie grasses and deciduous trees
Slope range: 0 to 2 percent

Typical Pedon

Modale silt loam, 0 to 2 percent slopes, rarely flooded, 1,100 feet east and 50 feet north of the southwest corner of sec. 21, T. 84 N., R. 46 W.; U.S.G.S. Topographic Quadrangle Onawa SW, Iowa; lat. 42 degrees 04 minutes 14 seconds N. and long. 96 degrees 12 minutes 37 seconds W.

Ap—0 to 7 inches; very dark grayish brown (2.5Y 3/2) silt loam, grayish brown (10YR 5/2) dry; cloddy structure parting to weak fine granular; friable; slightly effervescent; slightly alkaline; abrupt smooth boundary.

C1—7 to 24 inches; dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) silt loam; few fine distinct brown (7.5YR 4/4) redox concentrations; massive; friable; strongly effervescent; slightly alkaline; abrupt smooth boundary.

2C2—24 to 29 inches; dark grayish brown (10YR 4/2) silty clay; few fine faint dark gray (10YR 4/1) and grayish brown (10YR 5/2) redox depletions; massive with evidence of parting along planes of weakness; firm; strongly effervescent; slightly alkaline; clear smooth boundary.

2C3—29 to 60 inches; dark gray (10YR 4/1) and dark grayish brown (10YR 4/2) silty clay; few fine distinct brown (7.5YR 4/4) redox concentrations; massive with evidence of parting along planes of weakness; firm; layers of grayish brown (10YR 5/2) silt loam 1/2 inch thick at depths of 43, 48, and 51 inches; strongly effervescent; moderately alkaline.

Range in Characteristics

Combined thickness of the A and C horizons: 18 to 30 inches
Thickness of the solum: 6 to 10 inches
Depth to carbonates: 0 to 10 inches

Ap or A horizon:
Hue—10YR or 2.5Y
Value—3
Chroma—1 or 2
Texture—silty clay loam or silt loam

C horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2
Texture—silt loam

2C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—3 to 5
Chroma—2
Texture—silty clay

147—Modale silty clay loam, 0 to 2 percent slopes, rarely flooded

Composition

Modale and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains (young bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay loam
Depth to bedrock: More than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Silty alluvium over clayey alluvium
Frequency of flooding: Rare
Depth to the water table: 1.5 to 3.0 feet
Kind of water table: Perched
Available water capacity to 60 inches or root-limiting layer: About 9.6 inches (high)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Albaton and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

149—Modale silt loam, 0 to 2 percent slopes, rarely flooded

Composition

Modale and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood-plain splays
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Silty alluvium over clayey alluvium
Frequency of flooding: Rare
Depth to the water table: 1.5 to 3.0 feet
Kind of water table: Perched
Available water capacity to 60 inches or root-limiting layer: About 9.6 inches (high)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Albaton and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

1147—Modale silty clay loam, 0 to 2 percent slopes, occasionally flooded

Composition

Modale and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains (bar area)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay loam
Depth to bedrock: More than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Silty alluvium over clayey alluvium
Frequency of flooding: Occasional
Depth to the water table: 1.5 to 3.0 feet
Kind of water table: Perched
Available water capacity to 60 inches or root-limiting layer: About 9.6 inches (high)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Albaton and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

1150—Modale silt loam, 0 to 2 percent slopes, occasionally flooded

Composition

Modale and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood-plain splays
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Silty alluvium over clayey alluvium
Frequency of flooding: Occasional
Depth to the water table: 1.5 to 3.0 feet
Kind of water table: Perched
Available water capacity to 60 inches or root-limiting layer: About 9.6 inches (high)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Albaton and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Monona Series

Drainage class: Well drained
Permeability: Moderate
Landform: Uplands and stream terraces
Geomorphic component: Interfluves, head slopes, nose slopes, and side slopes
Parent material: Loess
Native vegetation: Prairie
Slope range: 0 to 40 percent

Typical Pedon

Monona silt loam, 2 to 5 percent slopes, in a cultivated field; 875 feet east and 60 feet north of the southwest corner of sec. 32, T. 82 N., R. 42 W.; U.S.G.S.

Topographic Quadrangle Moorhead SE, Iowa; lat. 41 degrees 51 minutes 45 seconds N. and long. 95 degrees 45 minutes 58 seconds W.

Ap—0 to 8 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; few fine and medium rounded wormcasts; slightly acid; abrupt smooth boundary.
A—8 to 14 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky and weak fine granular structure; friable; very dark brown (10YR 2/2) coatings on faces of peds; slightly acid; clear smooth boundary.
Bw1—14 to 20 inches; brown (10YR 4/3) silt loam; weak very fine and fine subangular blocky structure; friable; dark brown (10YR 3/3) coatings on faces of peds; slightly acid; clear wavy boundary.
Bw2—20 to 28 inches; brown (10YR 4/3) silt loam; weak fine and medium subangular blocky structure; friable; neutral; clear wavy boundary.
Bw3—28 to 38 inches; brown (10YR 4/3) and yellowish brown (10YR 5/4) silt loam; weak fine and medium subangular blocky structure; friable; neutral; gradual wavy boundary.
Bw4—38 to 42 inches; brown (10YR 4/3) silt loam; weak fine and medium subangular blocky structure; friable; neutral; gradual wavy boundary.
BC—42 to 54 inches; brown (10YR 4/3) and yellowish brown (10YR 5/4) silt loam; weak medium prismatic structure; friable; neutral; gradual wavy boundary.
C—54 to 60 inches; yellowish brown (10YR 5/4) silt loam; massive; friable; slightly alkaline.

Range in Characteristics

Thickness of the solum: 22 to 60 inches
Thickness of the mollic epipedon: 10 to 20 inches
Depth to carbonates: 36 to 60 inches

Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—silt loam

Bw horizon:
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—silt loam

C horizon:
Hue—10YR
Value—4 or 5
Chroma—3 to 6
Texture—silt loam

10B—Monona silt loam, 2 to 5 percent slopes

Composition

Monona and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Uplands
Geomorphic component: Interfluves
Hillslope position: Summits and shoulders
Slope range: 2 to 5 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.9 inches (high)
Content of organic matter in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Ida and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

10C—Monona silt loam, 5 to 9 percent slopes

Composition

Monona and similar soils: About 95 percent

Inclusions: About 5 percent

Setting

Landform: Uplands
Geomorphic component: Interfluves, head slopes, nose slopes, and side slopes
Hillslope position: Shoulders, summits, and backslopes
Slope range: 5 to 9 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.9 inches (high)
Content of organic matter in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Ida and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

10C2—Monona silt loam, 5 to 9 percent slopes, moderately eroded

Composition

Monona and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Uplands
Geomorphic component: Interfluves, head slopes, nose slopes, and side slopes
Hillslope position: Shoulders, summits, and backslopes
Slope range: 5 to 9 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.8 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Ida and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

10C3—Monona silt loam, 5 to 9 percent slopes, severely eroded

Composition

Monona and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Uplands
Geomorphic component: Interfluves, head slopes, nose slopes, and side slopes
Hillslope position: Shoulders, summits, and backslopes
Slope range: 5 to 9 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None

Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.8 inches (high)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Ida and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

10D—Monona silt loam, 9 to 14 percent slopes

Composition

Monona and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Backslopes and shoulders
Slope range: 9 to 14 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.9 inches (high)
Content of organic matter in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Ida and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

10D2—Monona silt loam, 9 to 14 percent slopes, moderately eroded

Composition

Monona and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Backslopes and shoulders
Slope range: 9 to 14 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.8 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Ida and similar soils

Major Uses of the Unit

- Cropland

- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

10D3—Monona silt loam, 9 to 14 percent slopes, severely eroded

Composition

Monona and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Backslopes and shoulders
Slope range: 9 to 14 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.8 inches (high)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Ida and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

10E—Monona silt loam, 14 to 20 percent slopes

Composition

Monona and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Backslopes
Slope range: 14 to 20 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.9 inches (high)
Content of organic matter in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Ida and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

10E2—Monona silt loam, 14 to 20 percent slopes, moderately eroded

Composition

Monona and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Backslopes
Slope range: 14 to 20 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.8 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Ida and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

10E3—Monona silt loam, 14 to 20 percent slopes, severely eroded

Composition

Monona and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Backslopes
Slope range: 14 to 20 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.8 inches (high)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Ida and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

10F—Monona silt loam, 20 to 30 percent slopes

Composition

Monona and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, side slopes, and interfluves
Hillslope position: Backslopes and narrow summits
Slope range: 20 to 30 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None

Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.9 inches (high)
Content of organic matter in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Ida and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

10F2—Monona silt loam, 20 to 30 percent slopes, moderately eroded

Composition

Monona and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, side slopes, and interfluves
Hillslope position: Backslopes and narrow summits
Slope range: 20 to 30 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.8 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Ida and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

10F3—Monona silt loam, 20 to 30 percent slopes, severely eroded

Composition

Monona and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, side slopes, and interfluves
Hillslope position: Backslopes and narrow summits
Slope range: 20 to 30 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.8 inches (high)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Ida and similar soils

Major Uses of the Unit

- Cropland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

10G—Monona silt loam, 30 to 40 percent slopes

Composition

Monona and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, side slopes, and interfluves
Hillslope position: Backslopes and narrow summits
Slope range: 30 to 40 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.9 inches (high)
Content of organic matter in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Ida and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

510—Monona silt loam, bench, 0 to 2 percent slopes

Composition

Monona and similar soils: 100 percent

Setting

Landform: Stream terraces
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.9 inches (high)
Content of organic matter in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

510B—Monona silt loam, bench, 2 to 5 percent slopes

Composition

Monona and similar soils: 100 percent

Setting

Landform: Stream terraces
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Shoulders, summits, and backslopes
Slope range: 2 to 5 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.9 inches (high)
Content of organic matter in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section

510C—Monona silt loam, bench, 5 to 9 percent slopes

Composition

Monona and similar soils: 100 percent

Setting

Landform: Stream terraces
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Shoulders and backslopes
Slope range: 5 to 9 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.9 inches (high)
Content of organic matter in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section

510C2—Monona silt loam, bench, 5 to 9 percent slopes, moderately eroded

Composition

Monona and similar soils: 100 percent

Setting

Landform: Stream terraces
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Shoulders and backslopes
Slope range: 5 to 9 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.8 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

510C3—Monona silt loam, bench, 5 to 9 percent slopes, severely eroded

Composition

Monona and similar soils: 100 percent

Setting

Landform: Stream terraces
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Shoulders and backslopes
Slope range: 5 to 9 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.8 inches (high)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Morconick Series

Drainage class: Well drained
Permeability: Moderate in the upper part and rapid in the lower part
Landform: Flood plains (meander scrolls)
Parent material: Sandy alluvium
Native vegetation: Mixed prairie grasses and deciduous trees
Slope range: 0 to 2 percent

Typical Pedon

Morconick very fine sandy loam, 0 to 2 percent slopes, occasionally flooded, in a cultivated field; 2,250 feet west and 80 feet south of the northeast corner of sec. 4, T. 85 N., R. 47 W.; U.S.G.S. Topographic Quadrangle Albaton, Iowa; lat. 42 degrees 12 minutes 53 seconds N. and long. 96 degrees 19 minutes 04 seconds W.

Ap—0 to 7 inches; very dark grayish brown (2.5Y 3/2) very fine sandy loam, dark grayish brown (2.5Y 4/2) rubbed, olive gray (5Y 5/2) dry; weak fine granular structure; friable; common fine roots throughout; few fine discontinuous tubular pores; strongly effervescent; slightly alkaline; clear smooth boundary.

C1—7 to 13 inches; dark grayish brown (2.5Y 4/2) silt loam; very dark grayish brown (2.5Y 3/2) horizontal faces; massive with evidence of horizontal parting; friable; few fine roots throughout; few fine discontinuous tubular pores; strongly effervescent; slightly alkaline; abrupt smooth boundary.

2C2—13 to 18 inches; olive brown (2.5Y 4/4) and dark grayish brown (2.5Y 4/2), stratified fine sandy loam; massive with evidence of horizontal parting; very friable; few thin discontinuous strata of grayish brown (2.5Y 5/2) silt loam; strongly effervescent; slightly alkaline; clear smooth boundary.

2C3—18 to 23 inches; olive brown (2.5Y 4/4) and grayish brown (2.5Y 5/2), stratified fine sandy loam; massive with evidence of horizontal parting; very friable; few thin discontinuous strata of grayish brown (2.5Y 5/2) silt loam; strongly effervescent; slightly alkaline; clear smooth boundary.

2C4—23 to 29 inches; olive brown (2.5Y 4/4) and grayish brown (2.5Y 5/2), stratified loamy fine sand; few fine prominent dark brown (7.5YR 4/4) and strong brown (7.5YR 5/6) redox concentrations; single grained; loose; strongly effervescent; slightly alkaline; clear smooth boundary.

2C5—29 to 41 inches; dark grayish brown (2.5Y 4/2), stratified loamy fine sand; few fine prominent strong brown (7.5YR 5/6) redox concentrations; single grained; loose; strongly effervescent; slightly alkaline; clear smooth boundary.

2C6—41 to 52 inches; grayish brown (2.5Y 5/2), stratified loamy fine sand; few fine prominent strong brown (7.5YR 5/6) redox concentrations; single grained; loose; slightly effervescent; slightly alkaline; clear smooth boundary.

3C7—52 to 57 inches; grayish brown (2.5Y 4/2) silt loam; massive with evidence of horizontal parting; friable; slightly effervescent; slightly alkaline; clear smooth boundary.

3C8—57 to 93 inches; grayish brown (2.5Y 5/2), stratified loamy fine sand; single grained; loose; slightly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the solum: 6 to 9 inches
Depth to carbonates: 0 to 10 inches

Ap or A horizon:
Hue—10YR or 2.5Y
Value—2 or 3
Chroma—2 or 3
Texture—silt loam, loam, or very fine sandy loam

C horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 or 3
Texture—silt loam, loam, or very fine sandy loam

2C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—fine sandy loam, fine sand, sand, loamy fine sand, or loamy sand

3C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—silt loam, loam, fine sandy loam, fine sand, sand, loamy fine sand, or loamy sand

1524—Morconick very fine sandy loam, 0 to 2 percent slopes, occasionally flooded

Composition

Morconick and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flood plains (meander scrolls)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Very fine sandy loam
Depth to bedrock: More than 93 inches
Drainage class: Well drained
Dominant parent material: Sandy alluvium
Frequency of flooding: Occasional
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.8 inches (low)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Haynie and similar soils
- Sarpy and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Moville Series

Drainage class: Somewhat poorly drained
Permeability: Moderate in the upper part and very slow in the lower part
Landform: Flood plains (old bottom land)
Parent material: Silty alluvium over clayey alluvium
Native vegetation: Mixed prairie grasses and deciduous trees
Slope range: 0 to 2 percent

Typical Pedon

Moville silt loam, 0 to 2 percent slopes, rarely flooded, in a cultivated field; 450 feet north and 400 feet east of the southwest corner of sec. 29, T. 84 N., R. 44 W.; U.S.G.S. Topographic Quadrangle Onawa, Iowa; lat. 42 degrees 03 minutes 10 seconds N. and long. 96 degrees 00 minutes 00 seconds W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; few very fine roots throughout; slightly effervescent; slightly alkaline; abrupt smooth boundary.

C—7 to 29 inches; stratified dark grayish brown (10YR 4/2) and brown (10YR 5/3) silt loam; few fine distinct brown (7.5YR 4/4) and dark yellowish brown (10YR 4/4) redox concentrations; massive;

friable; few very fine roots throughout; few very thin very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) strata; strongly effervescent; moderately alkaline; clear smooth boundary.

2Ab1—29 to 40 inches; black (N 2/0) silty clay; moderate fine subangular blocky and moderate fine granular structure; firm; few very fine roots throughout; strongly effervescent; slightly alkaline; clear smooth boundary.

2Ab2—40 to 50 inches; black (N 2/0) silty clay; moderate fine and very fine subangular blocky structure; firm; few very fine roots throughout; neutral; gradual smooth boundary.

2Bgb—50 to 60 inches; very dark gray (N 3/0) silty clay; few fine and medium distinct gray (5Y 5/1) redox depletions; weak fine prismatic and weak fine subangular blocky structure; firm; neutral; gradual smooth boundary.

2BCgb—60 to 72 inches; very dark gray (5Y 3/1) and dark gray (5Y 4/1) silty clay; common fine distinct gray (5Y 6/1) redox depletions and strong brown (7.5YR 5/6) redox concentrations; weak fine prismatic and weak fine subangular blocky structure; firm; slightly alkaline.

Range in Characteristics

Combined thickness of the A and C horizons: 18 to 32 inches
Thickness of the solum: 6 to 10 inches
Depth to carbonates: 0 to 10 inches

Ap or A horizon:
Hue—10YR or 2.5Y
Value—3 or 4
Chroma—2
Texture—silt loam

C horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 or 3
Texture—silt loam

2Ab horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value— 2 or 3
Chroma—0 or 1
Texture—silty clay

2Bgb horizon:
Hue—2.5Y, 5Y, or N
Value—3 to 6
Chroma—0 or 1
Texture—silty clay

275—Moville silt loam, 0 to 2 percent slopes, rarely flooded

Composition

Moville and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains (old bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 72 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Silty alluvium over clayey alluvium
Frequency of flooding: Rare
Depth to the water table: 1.5 to 2.5 feet
Kind of water table: Perched
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches (high)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Luton and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Napa Series

Drainage class: Very poorly drained
Permeability: Very slow
Landform: Flood plains (old bottom land)
Parent material: Clayey alluvium
Native vegetation: Prairie
Slope range: 0 to 2 percent

Typical Pedon

Napa silty clay loam, 0 to 2 percent slopes, rarely flooded, in a cultivated field; 1,250 feet west and 50 feet south of the northeast corner of sec. 9, T. 84 N., R. 45 W.; U.S.G.S. Topographic Quadrangle Onawa, Iowa; lat. 42 degrees 06 minutes 41 seconds N. and long. 96 degrees 04 minutes 57 seconds W.

Ep—0 to 1 inch; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; weak thin platy structure parting to weak fine granular; friable; very few faint patchy coatings of lime or carbonate on faces of peds; slightly alkaline; abrupt smooth boundary.

Ap—1 to 6 inches; black (N 2/0) silty clay, very dark gray (10YR 3/1) dry; weak fine granular and weak fine subangular blocky structure; firm; slightly alkaline; abrupt smooth boundary.

Bty—6 to 24 inches; black (N 2/0) silty clay, very dark gray (10YR 3/1) dry; weak fine granular and weak fine subangular blocky structure; firm; common fine threads of gypsum crystals; slightly effervescent; slightly alkaline; clear smooth boundary.

Btgy—24 to 30 inches; dark gray (2.5Y 4/0) silty clay; common fine distinct yellowish brown (10YR 5/6) redox concentrations; moderate coarse subangular blocky structure; firm; common fine and medium rounded gypsum crystals; strongly effervescent; slightly alkaline; gradual wavy boundary.

Cgy—30 to 47 inches; dark grayish brown (2.5Y 4/2) and olive brown (2.5Y 4/4) clay; colors are for a mottled horizon; massive; firm; few fine and medium rounded carbonate concretions and few fine rounded gypsum crystals; violently effervescent; moderately alkaline; gradual wavy boundary.

Cg—47 to 60 inches; gray (5Y 5/1) and light olive brown (2.5Y 5/6) clay; colors are for a mottled horizon; massive; firm; violently effervescent; moderately alkaline.

Range in Characteristics

Thickness of the solum: 24 to 48 inches
Thickness of the mollic epipedon: 20 to 50 inches
Depth to carbonates: 5 to 45 inches

Ep horizon:
Hue—10YR or N
Value—3 or 4
Chroma—0 or 1
Texture—silty clay loam

Ap or A horizon:
Hue—N to 5Y
Value—2 or 3
Chroma—0 or 1
Texture—silty clay

Bt horizon:
Hue—2.5Y, 5Y, or N
Value—2 or 3
Chroma—0 to 2
Texture—silty clay or clay

Cg horizon:
Hue—2.5Y or 5Y
Value—4 or 5
Chroma—1 to 6
Texture—silty clay or clay

68—Napa silty clay loam, 0 to 2 percent slopes, rarely flooded

Composition

Napa and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains (old bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay loam
Depth to bedrock: More than 60 inches
Drainage class: Very poorly drained
Dominant parent material: Clayey alluvium
Frequency of flooding: Rare
Water table depth: At the surface to 3 feet below the surface
Kind of water table: Perched
Salt-affected characteristics: Saline within a depth of 30 inches
Sodium-affected characteristics: Sodic within a depth of 30 inches
Available water capacity to 60 inches or root-limiting layer: About 8.7 inches (moderate)
Content of organic matter in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Luton and similar soils
- Tieville and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Napier Series

Drainage class: Well drained
Permeability: Moderate
Landform: Upland drainageways and alluvial fans
Geomorphic component: Base slopes
Parent material: Silty alluvium
Native vegetation: Prairie
Slope range: 2 to 14 percent

Typical Pedon

Napier silt loam, 5 to 9 percent slopes, in a hayfield; 1,835 feet west and 1,500 feet north of the southeast corner of sec. 27, T. 84 N., R. 44 W.; U.S.G.S. Topographic Quadrangle Castana, Iowa; lat. 42 degrees 03 minutes 21 seconds N. and long. 95 degrees 57 minutes 02 seconds W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine and very fine granular structure; friable; few fine roots throughout; neutral; abrupt smooth boundary.

A—8 to 18 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine and very fine granular structure; friable; few fine roots throughout; neutral; clear smooth boundary.

BA—18 to 28 inches; dark brown (10YR 3/3) silt loam; weak fine subangular blocky structure; friable; few fine roots throughout; common very dark grayish brown (10YR 3/2) wormcasts and pore fillings; neutral; gradual smooth boundary.

Bw1—28 to 36 inches; brown (10YR 4/3) silt loam; weak fine subangular blocky structure; friable; dark brown (10YR 3/3) coatings on faces of peds; few fine roots throughout; common dark brown (10YR 3/3) wormcasts and pore fillings; neutral; gradual wavy boundary.

Bw2—36 to 46 inches; brown (10YR 4/3) silt loam; weak medium subangular blocky structure; friable; few fine roots throughout; few dark brown (10YR 3/3) wormcasts and pore fillings; neutral; clear wavy boundary.

C1—46 to 60 inches; brown (10YR 4/3) silt loam; massive with evidence of parting along planes of weakness; friable; few fine roots throughout; few dark brown (10YR 3/3) wormcasts and pore fillings; few fine and medium lime concretions and soft masses of lime; strongly effervescent; slightly alkaline; gradual wavy boundary.

C2—60 to 80 inches; brown (10YR 4/3) silt loam; massive with evidence of parting along planes of weakness; friable; few fine roots throughout; few fine and medium lime concretions and soft masses of lime; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the solum: 36 to 60 inches
Thickness of the mollic epipedon: 24 to 40 inches
Depth to carbonates: 36 to 60 inches

Ap and A horizons:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam

Bw horizon:
Hue—10YR
Value—3 or 4
Chroma—3
Texture—silt loam

C horizon:
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—silt loam

12B—Napier silt loam, 2 to 5 percent slopes

Composition

Napier and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Alluvial fans and upland drainageways
Geomorphic component: Base slopes
Hillslope position: Footslopes and toeslopes
Slope range: 2 to 5 percent

Component Description

Texture of the surface layer: Silt loam

Depth to bedrock: More than 80 inches
Drainage class: Well drained
Dominant parent material: Silty alluvium
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 13.2 inches (high)
Content of organic matter in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Colo and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section

12C—Napier silt loam, 5 to 9 percent slopes

Composition

Napier and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Alluvial fans and upland drainageways
Geomorphic component: Base slopes
Hillslope position: Footslopes and toeslopes
Slope range: 5 to 9 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 80 inches
Drainage class: Well drained
Dominant parent material: Silty alluvium
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 13.2 inches (high)
Content of organic matter in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Ida and similar soils
- Colo and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section

12D—Napier silt loam, 9 to 14 percent slopes

Composition

Napier and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Alluvial fans and upland drainageways
Geomorphic component: Base slopes
Hillslope position: Footslopes and toeslopes
Slope range: 9 to 14 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 80 inches
Drainage class: Well drained
Dominant parent material: Silty alluvium
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 13.2 inches (high)
Content of organic matter in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Ida and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

17B—Napier-Kennebec-Colo complex, 0 to 5 percent slopes

Composition

Napier and similar soils: About 40 percent
Kennebec and similar soils: About 30 percent
Colo and similar soils: About 30 percent

Setting

Landform: Upland drainageways
Geomorphic component: Base slopes
Hillslope position: Footslopes and toeslopes
Slope range: 0 to 5 percent

Component Description

Napier

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Silty alluvium
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 13.2 inches (high)
Content of organic matter in the surface layer: About 3.5 percent (moderate)

Kennebec

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Silty alluvium
Flooding: None
Water table depth: 3 to 5 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 13.6 inches (high)
Content of organic matter in the surface layer: About 5.5 percent (high)

Colo

Texture of the surface layer: Silty clay loam
Depth to bedrock: More than 60 inches
Drainage class: Poorly drained
Dominant parent material: Silty alluvium
Flooding: None
Water table depth: At the surface to 1 foot below the surface
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 11.9 inches (high)
Content of organic matter in the surface layer: About 6 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section
- “Forest Land” section

717D—Napier-Gullied land complex, 5 to 14 percent slopes

Composition

Napier and similar soils: About 50 percent
Gullied land: About 50 percent

Setting

Landform: Upland drainageways
Geomorphic component: Base slopes
Hillslope position: Footslopes and toeslopes
Slope range: 5 to 14 percent

Component Description

Napier

Texture of the surface layer: Silt loam
Depth to bedrock: More than 80 inches
Drainage class: Well drained
Dominant parent material: Silty alluvium
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 13.2 inches (high)

Content of organic matter in the surface layer: About 3.5 percent (moderate)

Gullied land

Dominant parent material: Silty alluvium
Depth to the water table: More than 6.0 feet

A typical soil series description for the Napier soil with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section

Nishna Series

Drainage class: Poorly drained
Permeability: Slow
Landform: Flood plains
Parent material: Clayey alluvium
Native vegetation: Prairie
Slope range: 0 to 2 percent

Typical Pedon

Nishna silty clay loam, 0 to 2 percent slopes, occasionally flooded, in a cultivated field; 1,620 feet south and 165 feet east of the northwest corner of sec. 1, T. 83 N., R. 44 W.; U.S.G.S. Topographic Quadrangle Castana, Iowa; lat. 42 degrees 01 minute 59 seconds N. and long. 95 degrees 55 minutes 34 seconds W.

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam; weak fine granular structure; friable; common very fine roots throughout; common very fine tubular pores; strongly effervescent; slightly alkaline; abrupt smooth boundary.

A1—8 to 14 inches; black (10YR 2/1) silty clay loam; weak fine subangular blocky structure parting to weak fine granular; friable; few very fine roots throughout; common very fine tubular pores; strongly effervescent; slightly alkaline; gradual smooth boundary.

A2—14 to 24 inches; black (10YR 2/1) silty clay loam; weak fine subangular blocky structure; friable; few very fine roots throughout; common very fine tubular pores; strongly effervescent; slightly alkaline; gradual smooth boundary.

A3—24 to 30 inches; black (10YR 2/1) silty clay loam; weak fine and medium subangular blocky structure; friable; few very fine roots throughout; few very fine tubular pores; strongly effervescent; slightly alkaline; gradual smooth boundary.

A4—30 to 36 inches; black (10YR 2/1) silty clay; weak fine and medium subangular blocky structure; firm; few very fine roots throughout; few very fine tubular pores; strongly effervescent; slightly alkaline; gradual smooth boundary.

A5—36 to 50 inches; black (10YR 2/1) silty clay; weak medium subangular blocky structure; firm; few very fine tubular pores; strongly effervescent; slightly alkaline; gradual smooth boundary.

Bg—50 to 60 inches; very dark gray (N 3/0) silty clay loam; weak fine and medium prismatic structure; firm; few very fine tubular pores; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the solum: 24 to 52 inches
Thickness of the mollic epipedon: 24 to 46 inches
Depth to carbonates: 0 to 10 inches

Ap and A horizons:
Hue—10YR or N
Value—2 or 3
Chroma—0 or 1
Texture—silty clay loam or silty clay

Bg horizon:
Hue—10YR, 5Y, or N
Value—3
Chroma—0 or 1
Texture—silty clay or silty clay loam

C horizon (if it occurs):
Hue—10YR, 5Y, or N
Value—3 or 4
Chroma—0 or 1
Texture—silty clay or silty clay loam

234—Nishna silty clay loam, 0 to 2 percent slopes, occasionally flooded

Composition

Nishna and similar soils: 100 percent

Setting

Landform: Flood plains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay loam
Depth to bedrock: More than 60 inches
Drainage class: Poorly drained
Dominant parent material: Clayey alluvium
Frequency of flooding: Occasional
Water table depth: At the surface to 1 foot below the surface
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 7.5 inches (moderate)
Content of organic matter in the surface layer: About 5 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Nodaway Series

Drainage class: Moderately well drained
Permeability: Moderate
Landform: Flood plains
Parent material: Silty alluvium
Native vegetation: Mixed prairie grasses and deciduous trees
Slope range: 0 to 2 percent

Typical Pedon

Nodaway silt loam, 0 to 2 percent slopes, occasionally flooded, in a cultivated field; 200 feet north and 500 feet west of the southeast corner of sec. 7, T. 84 N., R. 43 W.; U.S.G.S. Topographic Quadrangle Castana, Iowa; lat. 42 degrees 01 minute 43 seconds N. and long. 95 degrees 54 minutes 24 seconds W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak fine granular structure; friable; few very fine roots throughout; few very fine discontinuous tubular pores; neutral; abrupt smooth boundary.

C—8 to 60 inches; stratified dark grayish brown (10YR 4/2), very dark gray (10YR 3/1), and grayish brown (10YR 5/2) silt loam; massive; friable; few fine roots throughout; few fine continuous tubular pores; neutral.

Range in Characteristics

Thickness of the solum: 6 to 10 inches
Thickness of the mollic epipedon: 6 to 10 inches
Depth to carbonates: More than 60 inches

Ap or A horizon:
Hue—10YR
Value—3
Chroma—1 or 2
Texture—silt loam

C horizon:
Hue—10YR
Value—3 to 5
Chroma—2 to 4
Texture—silt loam

220—Nodaway silt loam, 0 to 2 percent slopes, occasionally flooded

Composition

Nodaway and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Silty alluvium
Frequency of flooding: Occasional
Depth to the water table: 3 to 5 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 12.9 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- McPaul and similar soils

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section
- “Forest Land” section

1220—Nodaway silt loam, channeled, 0 to 2 percent slopes

Composition

Nodaway and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Silty alluvium
Flooding: None
Depth to the water table: 3 to 5 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 12.9 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Colo and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Onawa Series

Drainage class: Somewhat poorly drained
Permeability: Slow
Landform: Flood plains (bar area and young bottom land)
Parent material: Clayey alluvium and silty over clayey alluvium
Native vegetation: Mixed prairie grasses and deciduous trees
Slope range: 0 to 2 percent

Typical Pedon

Onawa silty clay, 0 to 2 percent slopes, rarely flooded, in a cultivated field; 50 feet west and 1,980 feet north of the southeast corner of sec. 1, T. 84 N., R. 47 W.; U.S.G.S. Topographic Quadrangle Macy, Iowa; lat. 42 degrees 07 minutes 26 seconds N. and long. 96 degrees 15 minutes 08 seconds W.

Ap—0 to 7 inches; very dark grayish brown (2.5Y 3/2) silty clay; moderate fine subangular blocky structure; firm; slightly alkaline; abrupt smooth boundary.

Cg1—7 to 23 inches; dark grayish brown (2.5Y 4/2) silty clay; few fine prominent red (2.5YR 5/8) and strong brown (7.5YR 5/8) redox concentrations; massive with evidence of vertical and horizontal parting; firm; layer of silty clay loam 1 inch thick at a depth of 18 to 19 inches; slightly alkaline; clear smooth boundary.

2Cg2—23 to 60 inches; dark grayish brown (10YR 4/2) and very dark gray (10YR 3/1) silt loam; few fine distinct strong brown (7.5YR 5/6) and reddish brown (5YR 4/3) redox concentrations; massive; firm; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the solum: 6 to 10 inches
Depth to carbonates: 0 to 10 inches

Ap or A horizon:
Hue—10YR or 2.5Y
Value—2 or 3
Chroma—1 or 2
Texture—silty clay

Cg horizon:
Hue—5Y or 2.5Y
Value—3 to 5
Chroma—1 or 2
Texture—silty clay

2Cg horizon:
Hue—10YR to 5Y

Value—4 or 5
Chroma—1 or 2
Texture—silt loam

145—Onawa silt loam, 0 to 2 percent slopes, rarely flooded

Composition

Onawa and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains (young bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Silty alluvium over clayey alluvium
Frequency of flooding: Rare
Depth to the water table: 2 to 4 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 11.5 inches (high)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Albaton and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

146—Onawa silty clay, 0 to 2 percent slopes, rarely flooded

Composition

Onawa and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flood plains (young bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay
Depth to bedrock: More than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Clayey alluvium
Frequency of flooding: Rare
Depth to the water table: 2 to 4 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 10.8 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Albaton and similar soils
- Rodney and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

1145—Onawa silt loam, 0 to 2 percent slopes, occasionally flooded

Composition

Onawa and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains (bar area)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Somewhat poorly drained

Dominant parent material: Silty alluvium over clayey alluvium
Frequency of flooding: Occasional
Depth to the water table: 2 to 4 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 11.6 inches (high)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Albaton and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section

1146—Onawa silty clay, 0 to 2 percent slopes, occasionally flooded

Composition

Onawa and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flood plains (bar area)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay
Depth to bedrock: More than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Clayey alluvium
Frequency of flooding: Occasional
Depth to the water table: 2 to 4 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 10.8 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Albaton and similar soils
- Rodney and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section

5040—Orthents, loamy

Component Description

Texture of the surface layer: Loam
Depth to bedrock: More than 60 inches
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.6 inches (moderate)

Major Uses of the Unit

- This map unit consists of areas from which soil material has been removed for use in other areas.

Owego Series

Drainage class: Poorly drained
Permeability: Very slow
Landform: Flood plains (bar area and young bottom land)
Parent material: Clayey alluvium over silty alluvium
Native vegetation: Mixed prairie grasses and deciduous trees
Slope range: 0 to 2 percent

Typical Pedon

Owego silty clay, 0 to 2 percent slopes, rarely flooded, in a cultivated field; 100 feet north and 75 feet west of the southeast corner of sec. 22, T. 85 N., R. 47 W.;

U.S.G.S. Topographic Quadrangle Albaton, Iowa; lat. 42 degrees 09 minutes 15 seconds N. and long. 96 degrees 17 minutes 26 seconds W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silty clay, gray (10YR 5/1) dry; weak fine granular structure; firm; few very fine roots; slightly alkaline; abrupt smooth boundary.
Cg1—9 to 17 inches; dark gray (5Y 4/1) and dark grayish brown (2.5Y 4/2) silty clay; weak fine and medium subangular blocky structure; friable; few very fine roots throughout; faint very dark gray (10YR 3/1) discontinuous coatings on faces of peds and in pores; slightly alkaline; clear smooth boundary.
Cg2—17 to 25 inches; grayish brown (2.5Y 5/2) silt loam; common fine distinct yellowish brown (10YR 5/4) redox concentrations; massive with horizontal and vertical parting; friable; few very fine roots throughout; few faint dark grayish brown (2.5Y 4/2) continuous coatings on faces of peds; strongly effervescent; slightly alkaline; clear smooth boundary.
Cg3—25 to 72 inches; dark gray (5Y 4/1) silty clay; common fine distinct dark yellowish brown (10YR 4/4) and strong brown (7.5YR 4/6) redox concentrations; massive; firm; few fine roots to a depth of 52 inches; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the solum: 6 to 9 inches
Thickness of the mollic epipedon: 6 to 9 inches
Depth to carbonates: 12 to 24 inches
Thickness of the silt loam: 6 to 14 inches

Ap or A horizon:
Hue—10YR or 2.5Y
Value—3
Chroma—1 or 2
Texture—silty clay

Cg1 horizon:
Hue—5Y or 2.5Y
Value—4
Chroma—1 or 2
Texture—silty clay

Cg2 horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 to 3
Texture—silt loam or silty clay loam

Cg3 horizon:
Hue—5Y or N
Value—4 or 5
Chroma—0 to 2
Texture—silty clay

552—Owego silty clay, 0 to 2 percent slopes, rarely flooded

Composition

Owego and similar soils: 100 percent

Setting

Landform: Flood plains (young bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay
Depth to bedrock: More than 72 inches
Drainage class: Poorly drained
Dominant parent material: Clayey alluvium over silty alluvium
Frequency of flooding: Rare
Water table depth: At the surface to 1 foot below the surface
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 8.1 inches (moderate)
Content of organic matter in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

1552—Owego silty clay, 0 to 2 percent slopes, occasionally flooded

Composition

Owego and similar soils: 100 percent

Setting

Landform: Flood plains (bar area)

Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay
Depth to bedrock: More than 72 inches
Drainage class: Poorly drained
Dominant parent material: Clayey alluvium over silty alluvium
Frequency of flooding: Occasional
Water table depth: At the surface to 1 foot below the surface
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 9.3 inches (high)
Content of organic matter in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section

Percival Series

Drainage class: Somewhat poorly drained
Permeability: Slow in the upper part and rapid in the lower part
Landform: Flood plains (bar area and young bottom land)
Parent material: Clayey alluvium over sandy alluvium
Native vegetation: Mixed prairie grasses and deciduous trees
Slope range: 0 to 2 percent

Typical Pedon

Percival silty clay, 0 to 2 percent slopes, rarely flooded, in a cultivated field; 1,125 feet north of the center of sec. 2, T. 83 N., R. 46 W.; U.S.G.S. Topographic Quadrangle Onawa SW, Iowa; lat. 42 degrees 02 minutes 13 seconds N. and long. 96 degrees 09 minutes 55 seconds W.

Ap—0 to 6 inches; very dark grayish brown (2.5Y 3/2) silty clay, dark grayish brown (2.5Y 4/2) dry; weak fine granular and weak fine subangular blocky structure; firm; many fine roots throughout; slightly effervescent; slightly alkaline; abrupt smooth boundary.

Cg1—6 to 23 inches; dark grayish brown (2.5Y 4/2) silty clay; common fine distinct reddish brown (5YR 4/4) redox concentrations; weak fine and medium angular blocky structure; firm; few fine roots throughout; strongly effervescent; slightly alkaline; clear smooth boundary.

2Cg2—23 to 60 inches; grayish brown (2.5Y 5/2) loamy fine sand; common fine distinct strong brown (7.5YR 5/6) and few faint light olive brown (2.5Y 5/6) redox concentrations; single grained; loose; slightly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the solum: 6 to 9 inches
Depth to carbonates: 0 to 9 inches
Depth to sand: 15 to 30 inches

Ap or A horizon:
Hue—10YR or 2.5Y
Value—3
Chroma—1 or 2
Texture—silty clay

Cg horizon:
Hue—2.5Y or 5Y
Value—4 or 5
Chroma—1 or 2
Texture—silty clay

2Cg horizon:
Hue—2.5Y
Value—4 to 6
Chroma—2
Texture—fine sand or loamy fine sand

515—Percival silty clay, 0 to 2 percent slopes, rarely flooded

Composition

Percival and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains (young bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay
Depth to bedrock: More than 60 inches
Drainage class: Somewhat poorly drained

Dominant parent material: Clayey alluvium over sandy alluvium
Frequency of flooding: Rare
Depth to the water table: 2 to 4 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 3.6 inches (low)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Moderately well drained soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

1515—Percival silty clay, 0 to 2 percent slopes, occasionally flooded

Composition

Percival and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flood plains (bar area)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay
Depth to bedrock: More than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Clayey alluvium over sandy alluvium
Frequency of flooding: Occasional
Depth to the water table: 2 to 4 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 3.6 inches (low)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Moderately well drained soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

5010—Pits, sand and gravel

Component Description

Texture of the surface layer: Sand and gravel
Depth to bedrock: More than 60 inches
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 2.7 inches (very low)
General information: This map unit consists of areas from which sand and gravel have been removed.

Rawles Series

Drainage class: Moderately well drained
Permeability: Moderate
Landform: Flood plains
Parent material: Calcareous alluvium
Native vegetation: Mixed prairie grasses and deciduous trees
Slope range: 0 to 2 percent

Typical Pedon

Rawles silt loam, 0 to 2 percent slopes, occasionally flooded, in a cultivated field; 1,100 feet east and 115 feet south of the northwest corner of sec. 17, T. 84 N., R. 43 W.; U.S.G.S. Topographic Quadrangle Castana, Iowa; lat. 42 degrees 05 minutes 38 seconds N. and long. 95 degrees 52 minutes 55 seconds W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak very fine and fine granular structure; friable; few fine roots throughout; few fine discontinuous

tubular pores; slightly effervescent; slightly alkaline; abrupt smooth boundary.

Cg—7 to 28 inches; very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) silt loam; massive with evidence of horizontal parting; friable; few fine roots throughout; few fine tubular pores; few fine rounded wormcasts; strongly effervescent; slightly alkaline; clear wavy boundary.

2Ab1—28 to 56 inches; very dark gray (10YR 3/1) silt loam; weak very fine and fine subangular blocky structure parting to weak very fine and fine granular structure; friable; few fine roots throughout; few fine tubular pores; few fine rounded wormcasts; slightly effervescent; slightly alkaline; gradual wavy boundary.

2Ab2—56 to 72 inches; black (10YR 2/1) silty clay loam; weak fine subangular blocky structure; friable; few fine roots throughout; few fine tubular pores; few fine rounded wormcasts; very slightly effervescent; slightly alkaline.

Range in Characteristics

Combined thickness of the A and C horizons: 20 to 40 inches
Thickness of the solum: 5 to 9 inches
Depth to carbonates: 0 to 9 inches

Ap or A horizon:
Hue—10YR
Value—3
Chroma—2 or 3
Texture—silt loam

Cg horizon:
Hue—10YR
Value—3 to 5
Chroma—2
Texture—silt loam

2Ab horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam or silty clay loam

670—Rawles silt loam, 0 to 2 percent slopes, occasionally flooded

Composition

Rawles and similar soils: 100 percent

Setting

Landform: Flood plains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 72 inches
Drainage class: Moderately well drained
Dominant parent material: Calcareous alluvium
Frequency of flooding: Occasional
Depth to the water table: 3 to 5 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 12.6 inches (high)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Rodney Series

Drainage class: Poorly drained
Permeability: Slow
Landform: Flood plains (bar area and young bottom land)
Parent material: Clayey alluvium over silty alluvium
Native vegetation: Mixed prairie grasses and deciduous trees
Slope range: 0 to 2 percent

Typical Pedon

Rodney silty clay, 0 to 2 percent slopes, rarely flooded, in a cultivated field; 100 feet west and 100 feet north of the southeast corner of sec. 3, T. 85 N., R. 47 W.; U.S.G.S. Topographic Quadrangle Albaton, Iowa; lat. 42 degrees 12 minutes 00 seconds N. and long. 96 degrees 17 minutes 27 seconds W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silty clay; moderate fine and very fine subangular structure parting to moderate very fine granular; firm; few fine roots throughout; slightly effervescent; slightly alkaline; abrupt smooth boundary.

Cg1—9 to 16 inches; dark grayish brown (2.5Y 4/2) and grayish brown (2.5Y 5/2) silt loam; common fine distinct dark yellowish brown (10YR 4/4) redox concentrations and few fine distinct dark gray (10YR 4/1) and gray (10YR 5/1) redox depletions; massive parting along planes of weakness; friable; few very fine roots throughout; slightly effervescent; slightly alkaline; clear smooth boundary.

Cg2—16 to 28 inches; grayish brown (2.5Y 5/2) and dark grayish brown (2.5Y 4/2) silt loam; common fine distinct dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/6) redox concentrations and few fine distinct dark gray (10YR 4/1) and gray (10YR 5/1) redox depletions; massive; friable; strongly effervescent; moderately alkaline; clear smooth boundary.

2Ab—28 to 35 inches; very dark gray (10YR 3/1) silty clay; common fine distinct dark yellowish brown (10YR 4/4) redox concentrations; moderate very fine prismatic and subangular blocky structure; firm; strongly effervescent; moderately alkaline; gradual smooth boundary.

2Bgb—35 to 54 inches; dark grayish brown (2.5Y 4/2) silty clay; common fine distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) redox concentrations; moderate medium prismatic and moderate medium angular blocky structure; firm; few very fine roots throughout; strongly effervescent; moderately alkaline; gradual smooth boundary.

2Cgb—54 to 78 inches; dark gray (5Y 4/1) silty clay; common fine prominent dark yellowish brown (10YR 4/4) redox concentrations; massive parting along planes of weakness; firm; few fine irregular carbonate threads; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the solum: 6 to 9 inches
Depth to carbonates: 0 to 10 inches

Ap or A horizon:
Hue—10YR or 2.5Y
Value—2 or 3
Chroma—1 or 2
Texture—silty clay

Cg horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—1 or 2
Texture—silt loam

2Ab horizon:
Hue—10YR to 5Y
Value—2 or 3
Chroma—1 or 2
Texture—silty clay

2Bgb horizon:
Hue—10YR to 5Y
Value—4 to 6
Chroma—1 or 2
Texture—silty clay

2Cgb horizon:
Hue—10YR to 5Y
Value—4 to 6
Chroma—1 or 2
Texture—silty clay

747—Rodney silty clay, 0 to 2 percent slopes, rarely flooded

Composition

Rodney and similar soils: 100 percent

Setting

Landform: Flood plains (young bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay
Depth to bedrock: More than 78 inches
Drainage class: Poorly drained
Dominant parent material: Clayey over silty alluvium
Frequency of flooding: Rare
Water table depth: At the surface to 1 foot below the surface
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 9.3 inches (high)
Content of organic matter in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

1747—Rodney silty clay, 0 to 2 percent slopes, occasionally flooded

Composition

Rodney and similar soils: 100 percent

Setting

Landform: Flood plains (bar area)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay
Depth to bedrock: More than 78 inches
Drainage class: Poorly drained
Dominant parent material: Clayey over silty alluvium
Frequency of flooding: Occasional
Water table depth: At the surface to 1 foot below the surface
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 9.3 inches (high)
Content of organic matter in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section

Salix Series

Drainage class: Moderately well drained
Permeability: Moderate
Landform: Flood plains (old bottom land)
Parent material: Silty alluvium
Native vegetation: Prairie
Slope range: 0 to 2 percent

Typical Pedon

Salix silty clay loam, 0 to 2 percent slopes, rarely flooded, 120 feet west and 2,530 feet south of the northeast corner of sec. 36, T. 85 N., R. 46 W.; U.S.G.S. Topographic Quadrangle Sloan, Iowa; lat. 42 degrees 08 minutes 05 seconds N. and long. 96 degrees 08 minutes 11 seconds W.

Ap—0 to 7 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; few fine and medium roots throughout; neutral; clear smooth boundary.

A—7 to 17 inches; black (10YR 2/1) and very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; weak very fine subangular blocky structure parting to weak fine granular; friable; few fine and medium roots throughout; slightly acid; clear smooth boundary.

Bw1—17 to 20 inches; dark grayish brown (2.5Y 4/2) silty clay loam; very dark gray (10YR 3/1) on faces of peds; weak very fine subangular blocky structure; friable; few fine and medium roots throughout; neutral; clear smooth boundary.

Bw2—20 to 23 inches; grayish brown (2.5Y 5/2) silty clay loam; very dark grayish brown (2.5Y 3/2) on faces of peds; weak fine and medium subangular blocky structure; friable; few fine and medium roots throughout; neutral; clear smooth boundary.

Bw3—23 to 33 inches; grayish brown (2.5Y 5/2) silt loam; dark grayish brown (2.5Y 4/2) on faces of peds; common fine distinct dark brown (7.5YR 3/2) and brown (7.5YR 4/4) redox concentrations; weak medium subangular blocky structure; friable; few fine and medium roots throughout; neutral; clear smooth boundary.

BC—33 to 40 inches; grayish brown (2.5Y 5/2) silt loam; dark grayish brown (2.5Y 4/2) on faces of peds; common fine distinct brown (7.5YR 4/2 and 4/4) redox concentrations; weak medium subangular blocky structure; friable; few fine and medium roots throughout; few fine soft masses of lime; strongly effervescent; slightly alkaline; gradual smooth boundary.

C—40 to 60 inches; grayish brown (2.5Y 5/2) silt loam; common fine distinct brown (7.5YR 4/2 and 4/4) redox concentrations; massive; friable; few fine soft masses of lime; strongly effervescence; slightly alkaline.

Range in Characteristics

Thickness of the solum: 24 to 40 inches
Thickness of the mollic epipedon: 14 to 20 inches
Depth to carbonates: 24 to 36 inches

Ap and A horizons:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silty clay loam

Bw horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 or 3
Texture—silty clay loam or silt loam

C horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 or 3
Texture—silt loam

36—Salix silty clay loam, 0 to 2 percent slopes, rarely flooded

Composition

Salix and similar soils: 100 percent

Setting

Landform: Flood plains (old bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay loam
Depth to bedrock: More than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Silty alluvium
Frequency of flooding: Rare
Depth to the water table: 4 to 6 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 12.7 inches (high)
Content of organic matter in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Sarpy Series

Drainage class: Excessively drained
Permeability: Rapid
Landform: Flood plains (bar area and young bottom land)
Parent material: Sandy alluvium
Native vegetation: Mixed prairie grasses and deciduous trees
Slope range: 0 to 5 percent

Typical Pedon

Sarpy loamy fine sand, 0 to 2 percent slopes, occasionally flooded, 2,190 feet east and 90 feet south of the northwest corner of sec. 5, T. 85 N., R. 47 W.; U.S.G.S. Topographic Quadrangle Albaton, Iowa; lat. 42 degrees 12 minutes 52 seconds N. and long. 96 degrees 20 minutes 24 seconds W.

Ap—0 to 6 inches; dark brown (10YR 3/3) loamy fine sand, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; few fine roots throughout; slightly effervescent; slightly alkaline; clear smooth boundary.

C—6 to 60 inches; dark grayish brown (2.5Y 4/2) and grayish brown (2.5Y 5/2) loamy fine sand; weak fine granular structure parting to single grained; few fine roots throughout; strongly effervescent; moderately alkaline

Range in Characteristics

Thickness of the solum: 4 to 9 inches
Depth to carbonates: 0 to 60 inches

Ap or A horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—1 to 3
Texture—loamy fine sand or fine sandy loam

C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—loamy fine sand or fine sand

237—Sarpy loamy fine sand, 0 to 2 percent slopes, rarely flooded

Composition

Sarpy and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains (young bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Loamy fine sand

Depth to bedrock: More than 60 inches
Drainage class: Excessively drained
Dominant parent material: Sandy alluvium
Frequency of flooding: Rare
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.2 inches (low)
Content of organic matter in the surface layer: About 0.75 percent (low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Haynie and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

237B—Sarpy loamy fine sand, 2 to 5 percent slopes, rarely flooded

Composition

Sarpy and similar soils: 100 percent

Setting

Landform: Flood plains (young bottom land)
Slope range: 2 to 5 percent

Component Description

Texture of the surface layer: Loamy fine sand
Depth to bedrock: More than 60 inches
Drainage class: Excessively drained
Dominant parent material: Sandy alluvium
Frequency of flooding: Rare
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.2 inches (low)
Content of organic matter in the surface layer: About 0.75 percent (low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

1237—Sarpy loamy fine sand, 0 to 2 percent slopes, occasionally flooded

Composition

Sarpy and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains (bar area)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Loamy fine sand
Depth to bedrock: More than 60 inches
Drainage class: Excessively drained
Dominant parent material: Sandy alluvium
Frequency of flooding: Occasional
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.2 inches (low)
Content of organic matter in the surface layer: About 0.75 percent (low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Haynie and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

1237B—Sarpy loamy fine sand, 2 to 5 percent slopes, occasionally flooded

Composition

Sarpy and similar soils: 100 percent

Setting

Landform: Flood plains (bar area)
Slope range: 2 to 5 percent

Component Description

Texture of the surface layer: Loamy fine sand
Depth to bedrock: More than 60 inches
Drainage class: Excessively drained
Dominant parent material: Sandy alluvium
Frequency of flooding: Occasional
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.2 inches (low)
Content of organic matter in the surface layer: About 0.75 percent (low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Scroll Series

Drainage class: Somewhat poorly drained
Permeability: Slow or moderately slow in the upper part and rapid in the lower part
Landform: Flood plains (meander scrolls)
Parent material: Clayey alluvium over sandy alluvium
Native vegetation: Prairie grasses
Slope range: 0 to 2 percent

Typical Pedon

Scroll silty clay, 0 to 2 percent slopes, occasionally flooded, in a cultivated field; 1,150 feet west and 100 feet south of the center of sec. 33, T. 84 N., R. 46 W.; U.S.G.S. Topographic Quadrangle Onawa SW, Iowa; lat. 42 degrees 02 minutes 52 seconds N. and long. 96 degrees 12 minutes 28 seconds W.

Ap—0 to 7 inches; dark olive gray (5Y 3/2) and olive gray (5Y 4/2) silty clay, olive gray (5Y 5/2) dry; few fine prominent dark brown (7.5YR 3/2) redox concentrations; weak fine and medium subangular blocky structure; firm; many fine roots throughout; slightly effervescent; slightly alkaline; abrupt smooth boundary.

Cg1—7 to 11 inches; olive gray (5Y 4/2) silt loam; common fine prominent brown (7.5YR 4/4) redox concentrations; massive; friable; few fine roots throughout; strongly effervescent; slightly alkaline; abrupt smooth boundary.

2Cg2—11 to 43 inches; grayish brown (2.5Y 5/2) and light brownish gray (2.5Y 6/2) loamy fine sand; common fine prominent brown (7.5YR 4/4) redox concentrations; single grained; loose; strongly effervescent; slightly alkaline; gradual smooth boundary.

2Cg3—43 to 60 inches; dark grayish brown (2.5Y 4/2) fine sandy loam; single grained; loose; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the solum: 6 to 9 inches
Carbonates: At the surface

Ap or A horizon:
Hue—10YR or 5Y
Value—3 or 4
Chroma—1 or 2
Texture—silty clay or silty clay loam

Cg horizon:
Hue—2.5Y or 5Y
Value—4 or 5
Chroma—2
Texture—silt loam

2Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—2
Texture—loamy fine sand, fine sandy loam, or sand

1525—Scroll silty clay, 0 to 2 percent slopes, occasionally flooded

Composition

Scroll and similar soils: 100 percent

Setting

Landform: Flood plains (meander scrolls)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay
Depth to bedrock: More than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Clayey alluvium over sandy alluvium
Frequency of flooding: Occasional
Depth to the water table: 2 to 4 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 3.1 inches (low)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

1526—Scroll silty clay loam, 0 to 2 percent slopes, occasionally flooded

Composition

Scroll and similar soils: 100 percent

Setting

Landform: Flood plains (meander scrolls)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay loam
Depth to bedrock: More than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Clayey alluvium over sandy alluvium
Frequency of flooding: Occasional
Depth to the water table: 2 to 4 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 3.9 inches (low)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

SL—Sewage lagoon

Component Description

- This map unit consists of shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid waste.

Smithland Series

Drainage class: Somewhat poorly drained
Permeability: Moderate
Landform: Flood plains (young bottom land)
Parent material: Silty alluvium
Native vegetation: Prairie
Slope range: 0 to 2 percent

Typical Pedon

Smithland silty clay loam, 0 to 2 percent slopes, occasionally flooded, in a cultivated field; 195 feet west and 95 feet north of the southeast corner of sec. 5, T. 84 N., R. 43 W.; U.S.G.S. Topographic Quadrangle Mapleton SE, Iowa; lat. 42 degrees 06 minutes 39 seconds N. and long. 95 degrees 52 minutes 01 second W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) silty clay loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; few very fine roots throughout; few very fine discontinuous tubular pores; neutral (pH 7.0); abrupt smooth boundary.

A1—7 to 16 inches; black (10YR 2/1) silty clay loam, dark grayish brown (10YR 4/2) dry; loam; weak fine subangular blocky structure parting to weak fine granular; friable; few fine roots throughout; few fine continuous tubular pores; neutral (pH 6.8); clear smooth boundary.

A2—16 to 24 inches; black (10YR 2/1) and very dark

gray (10YR 3/1) silty clay loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; few fine roots throughout; continuous tubular pores; neutral (pH 6.7); clear smooth boundary.

A3—24 to 34 inches; very dark gray (10YR 3/1) silty clay loam; few fine distinct brown and dark brown (7.5YR 4/4) redox concentrations; weak very fine and fine subangular blocky structure; friable; few fine roots throughout; few fine continuous tubular pores; neutral (pH 6.6); clear wavy boundary.

Bg—34 to 40 inches; very dark gray (10YR 3/1) silty clay loam; few fine distinct yellowish brown (10YR 5/4) redox concentrations; weak very fine and fine subangular blocky structure; friable; few fine roots throughout; few very fine continuous tubular pores; neutral (pH 6.6); gradual smooth boundary.

BCg—40 to 50 inches; very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) silty clay loam; few fine distinct yellowish brown (10YR 5/4) and brown (7.5YR 5/4) redox concentrations; weak fine and medium subangular blocky structure; friable; few fine continuous tubular pores; neutral (pH 6.6); gradual smooth boundary.

Cg—50 to 60 inches; very dark grayish brown (10YR 4/2) silty clay loam; few fine distinct yellowish brown (10YR 5/4) and common brown and dark brown (7.5YR 4/4) redox concentrations; massive parting along planes of weakness; friable; few very fine continuous tubular pores; neutral (pH 7.0).

Range in Characteristics

Thickness of the solum: 36 to 60 inches
Thickness of the mollic epipedon: 32 or more inches
Depth to carbonates: 60 or more inches

Ap and A horizons:
Hue—10YR or N
Value—2 or 3
Chroma—0 or 1
Texture—silty clay loam

Bg horizon:
Hue—10YR or 2.5Y
Value—2 to 4
Chroma—1 or 2
Texture—silty clay loam

Cg horizon:
Hue—10YR to 5Y
Value—2 to 6
Chroma—1 or 2
Texture—silty clay loam or silt loam

266—Smithland silty clay loam, 0 to 2 percent slopes, occasionally flooded

Composition

Smithland and similar soils: 100 percent

Setting

Landform: Flood plains (young bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay loam
Depth to bedrock: More than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Silty alluvium
Frequency of flooding: Occasional
Depth to the water table: 2 to 4 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 11.9 inches (high)
Content of organic matter in the surface layer: About 6 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Steinauer Series

Drainage class: Well drained
Permeability: Moderately slow
Landform: Uplands
Geomorphic component: Head slopes, nose slopes, and side slopes
Parent material: Pre-Wisconsin till
Native vegetation: Prairie
Slope range: 9 to 40 percent

Typical Pedon

Steinauer clay loam, 25 to 40 percent slopes, 400 feet west and 1,830 feet north of the southeast corner of

sec. 33, T. 84 N., R. 44 W.; U.S.G.S. Topographic Quadrangle Castana, Iowa; lat. 42 degrees 02 minutes 32 seconds N. and long. 95 degrees 57 minutes 51 seconds W.

A—0 to 6 inches; very dark grayish brown (10YR 3/2) clay loam, dark grayish brown (10YR 4/2) dry; weak fine and very fine granular structure; friable; about 5 percent pebbles; few fine rounded carbonate concretions; strongly effervescent; moderately alkaline; abrupt smooth boundary.

AC—6 to 12 inches; mottled grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) clay loam; weak fine prismatic structure parting to weak fine subangular blocky; friable; about 5 percent pebbles; few very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) wormcasts and pore fillings; common fine and medium rounded carbonate concretions; strongly effervescent; moderately alkaline; clear smooth boundary.

C1—12 to 20 inches; yellowish brown (10YR 5/4) clay loam; common fine distinct grayish brown (10YR 5/2) and light gray (10YR 6/1) relict redox depletions; massive with evidence of parting along planes of weakness; firm; about 5 percent pebbles; common fine and medium rounded carbonate concretions; strongly effervescent; moderately alkaline; gradual wavy boundary.

C2—20 to 30 inches; mottled light brownish gray (10YR 6/2) and yellowish brown (10YR 5/4) clay loam; few fine prominent reddish brown (5YR 4/4) relict redox concentrations; massive; firm; about 5 percent pebbles; few very coarse rounded carbonate concretions; strongly effervescent; moderately alkaline; gradual wavy boundary.

C3—30 to 44 inches; light brownish gray (10YR 6/2) clay loam; common fine faint yellowish brown (10YR 5/4) and light yellowish brown (10YR 6/4) relict redox concentrations; massive; firm; about 5 percent pebbles; common fine and medium rounded carbonate nodules and few fine irregular soft masses of carbonate; strongly effervescent; moderately alkaline; gradual wavy boundary.

C4—44 to 60 inches; mottled yellowish brown (10YR 5/4 and 5/6) and light gray (10YR 6/1) clay loam; massive; firm; about 5 percent pebbles; few fine and medium irregular soft masses of carbonate; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the solum: 4 to 21 inches
Depth to carbonates: 0 to 10 inches

A horizon:
Hue—10YR
Value—3 to 5
Chroma—1 or 2
Texture—clay loam

AC horizon:
Hue—10YR
Value—4 or 5
Chroma—2 to 4
Texture—clay loam

C horizon:
Hue—10YR
Value—5 or 6
Chroma—2 to 4
Texture—clay loam or loam

33D—Steinauer clay loam, 9 to 14 percent slopes

Composition

Steinauer and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Backslopes
Slope range: 9 to 14 percent

Component Description

Texture of the surface layer: Clay loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Pre-Wisconsin till
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.7 inches (high)
Content of organic matter in the surface layer: About 1.25 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Castana and similar soils
- Ida and similar soils

Major Uses of the Unit

- Cropland

- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

33E—Steinauer clay loam, 14 to 18 percent slopes

Composition

Steinauer and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Backslopes
Slope range: 14 to 18 percent

Component Description

Texture of the surface layer: Clay loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Pre-Wisconsin till
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.7 inches (high)
Content of organic matter in the surface layer: About 1.25 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Castana and similar soils

Major Uses of the Unit

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- “Wildlife Habitat” section

33F—Steinauer clay loam, 18 to 25 percent slopes

Composition

Steinauer and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Backslopes
Slope range: 18 to 25 percent

Component Description

Texture of the surface layer: Clay loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Pre-Wisconsin till
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.7 inches (high)
Content of organic matter in the surface layer: About 1.25 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Castana and similar soils
- Ida and similar soils

Major Uses of the Unit

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- “Wildlife Habitat” section

33G—Steinauer clay loam, 25 to 40 percent slopes

Composition

Steinauer and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Backslopes
Slope range: 25 to 40 percent

Component Description

Texture of the surface layer: Clay loam
Depth to bedrock: More than 60 inches
Drainage class: Well drained
Dominant parent material: Pre-Wisconsin till
Flooding: None
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.7 inches (high)
Content of organic matter in the surface layer: About 1.25 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Castana and similar soils
- Ida and similar soils

Major Uses of the Unit

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- “Wildlife Habitat” section

Ticonic Series

Drainage class: Moderately well drained
Permeability: Rapid in the upper part and moderate in the lower part
Landform: Flood plains (bar area)
Parent material: Sandy alluvium
Native vegetation: Mixed prairie grasses and deciduous trees
Slope range: 0 to 2 percent

Typical Pedon

Ticonic fine sand, 0 to 2 percent slopes, occasionally flooded, 3,500 feet west and 3,150 feet south of the northeast corner of sec. 17, T. 83 N., R. 46 W.; U.S.G.S. Topographic Quadrangle Onawa SW, Iowa; lat. 42 degrees 00 minutes 12 seconds N. and long. 96 degrees 13 minutes 36 seconds W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) fine sand, light brownish gray (10YR 6/2) dry; single grained; loose; common fine roots throughout; very slightly effervescent; slightly alkaline; abrupt smooth boundary.

C1—8 to 16 inches; brown (10YR 5/3) and pale brown (10YR 6/3), stratified fine sand and sand; single grained; loose; few fine roots throughout; very slightly effervescent; slightly alkaline; gradual smooth boundary.

C2—16 to 23 inches; grayish brown (10YR 5/2) and light brownish gray (10YR 6/2), stratified fine sand and sand; few fine distinct yellowish brown (10YR 5/4) relict redox concentrations; single grained; loose; few fine roots throughout; slightly effervescent; slightly alkaline; clear smooth boundary.

C3—23 to 28 inches; grayish brown (2.5Y 5/2), stratified loamy fine sand and fine sandy loam; few fine distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) relict redox concentrations; massive with evidence of horizontal parting; very friable; few fine roots throughout; strongly effervescent; slightly alkaline; clear smooth boundary.

2C4—28 to 38 inches; grayish brown (2.5Y 5/2), stratified loam and fine sandy loam; few fine distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) relict redox concentrations and few fine prominent strong brown (7.5YR 5/6) relict redox concentrations; massive with evidence of horizontal parting; very friable; few fine roots throughout; strongly effervescent; slightly alkaline; clear smooth boundary.

2C5—38 to 52 inches; grayish brown (2.5Y 5/2) silt loam; few fine distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) relict redox concentrations and few fine prominent strong brown (7.5YR 5/6) relict redox concentrations; massive with evidence of horizontal parting; friable; few very thin strata of fine sandy loam and loamy fine sand; strongly effervescent; slightly alkaline; clear smooth boundary.

3C6—52 to 72 inches; light brownish gray (2.5Y 6/2) and grayish brown (2.5Y 5/2), stratified loamy fine sand, fine sandy loam, and fine sand; few fine distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) relict redox concentrations; massive with evidence of horizontal parting; very friable; slightly

effervescent; slightly alkaline; clear smooth boundary.

4C7—72 to 80 inches; dark grayish brown (2.5Y 4/2) and grayish brown (2.5Y 5/2), stratified silty clay and silty clay loam; few fine distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) relict redox concentrations and few fine prominent strong brown (7.5YR 5/6) relict redox concentrations; massive with evidence of horizontal parting; firm; strongly effervescent; slightly alkaline.

Range in Characteristics

Combined thickness of the A and C horizons: 11 to 41 inches
Thickness of the solum: 4 to 9 inches
Depth to carbonates: 0 to 10 inches

Ap or A horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—2 to 4
Texture—fine sand, loamy fine sand, or fine sandy loam

C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 or 3
Texture—loamy fine sand or fine sand

2C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—silt loam or silty clay loam

3C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—stratified fine sand, loamy fine sand, fine sandy loam, or silt loam

1750—Ticonic fine sand, 0 to 2 percent slopes, occasionally flooded

Composition

Ticonic and similar soils: 100 percent

Setting

Landform: Flood plains (bar area)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Fine sand
Depth to bedrock: More than 80 inches
Drainage class: Well drained
Dominant parent material: Sandy alluvium
Frequency of flooding: Occasional
Depth to the water table: More than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.1 inches (moderate)
Content of organic matter in the surface layer: About 0.75 percent (low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section
- “Forest Land” section

Tieville Series

Drainage class: Poorly drained
Permeability: Very slow
Landform: Flood plains (old bottom land)
Parent material: Clayey alluvium
Native vegetation: Prairie
Slope range: 0 to 2 percent

Typical Pedon

Tieville silty clay, 0 to 2 percent slopes, rarely flooded, in a cultivated field; 2,500 feet north and 300 feet west of the southeast corner of sec. 15, T. 85 N., R. 45 W.; U.S.G.S. Topographic Quadrangle Hornick, Iowa; lat. 42 degrees 10 minutes 38 seconds N. and long. 96 degrees 03 minutes 35 seconds W.

Ap—0 to 7 inches; black (10YR 2/1) silty clay, very dark gray (10YR 4/1) dry; weak fine subangular blocky structure; firm; few fine roots throughout; slightly effervescent; slightly alkaline; abrupt smooth boundary.

A—7 to 22 inches; black (10YR 2/1) silty clay, dark gray (10YR 4/1) dry; moderate medium subangular blocky structure; firm; few very fine and fine roots between peds; few fine irregular soft masses of carbonate; strongly effervescent; slightly alkaline; clear smooth boundary.

Bg1—22 to 30 inches; dark gray (10YR 4/1) and very dark gray (10YR 3/1) silty clay; moderate medium subangular blocky structure; firm; few fine irregular soft masses of carbonate; strongly effervescent; slightly alkaline; clear smooth boundary.

Bg2—30 to 38 inches; dark gray (10YR 4/1) silty clay; common fine distinct brown (7.5YR 4/4) redox concentrations; firm; few fine irregular soft masses of carbonate and few fine and medium rounded carbonate concretions; violently effervescent; moderately alkaline; clear smooth boundary.

Cg—38 to 60 inches; gray (10YR 5/1) silty clay; common medium and coarse distinct yellowish brown (10YR 5/6) redox concentrations; firm; pressure faces; few fine irregular carbonate concretions; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the solum: 32 to 60 inches
Thickness of the mollic epipedon: 15 to 50 inches
Depth to carbonates: 0 to 9 inches

Ap and A horizons:
Hue—10YR or 2.5Y
Value—2 or 3
Chroma—1 or 2
Texture—silty clay

Bg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—2 to 4
Chroma—1 or 2
Texture—silty clay

Cg horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—1 or 2
Texture—silty clay

465—Tieville silty clay, 0 to 2 percent slopes, rarely flooded

Composition

Tieville and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains (old bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay
Depth to bedrock: More than 60 inches
Drainage class: Poorly drained
Dominant parent material: Clayey alluvium
Frequency of flooding: Rare
Water table depth: At the surface to 1 foot below the surface
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 6.7 inches (moderate)
Content of organic matter in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Napa and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section
- “Forest Land” section

Uturin Series

Drainage class: Poorly drained
Permeability: Slow
Landform: Flood plains
Parent material: Silty alluvium over clayey alluvium
Native vegetation: Mixed prairie grasses and deciduous trees
Slope range: 0 to 2 percent

Typical Pedon

Uturin silt loam, 0 to 2 percent slopes, occasionally flooded, in a cultivated field; 750 feet west and 2,450 feet south of the northeast corner of sec. 36, T. 82 N.,

R. 44 W.; U.S.G.S. Topographic Quadrangle Pisgah, Iowa; lat. 41 degrees 52 minutes 17 seconds N. and long. 95 degrees 54 minutes 32 seconds W.

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; common fine roots; common fine tubular pores; moderately acid; abrupt smooth boundary.
C—6 to 25 inches; stratified very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) silt loam; few fine prominent yellowish brown (10YR 5/6) redox concentrations; weak thin platy structure; friable; common fine roots throughout; common fine tubular pores; medium acid; clear smooth boundary.
2Ab1—25 to 39 inches; black (10YR 2/1) silty clay loam; weak fine subangular blocky structure parting to weak fine granular; friable; common fine roots throughout; common fine tubular pores; strongly effervescent; slightly alkaline; clear smooth boundary.
2Ab2—39 to 55 inches; black (10YR 2/1) silty clay loam; weak fine and medium subangular blocky structure; friable; few fine roots; strongly effervescent; slightly alkaline; clear smooth boundary.
2Bg—55 to 60 inches; black (10YR 3/1) silty clay loam; moderate fine subangular blocky structure; firm; slightly effervescent; moderately alkaline.

Range in Characteristics

Combined thickness of the A and C horizons: 20 to 40 inches
Thickness of the solum: 5 to 10 inches
Depth to carbonates: 0 to 10 inches

Ap or A horizon:
Hue—10YR
Value—3
Chroma—2 or 3
Texture—silt loam

C horizon:
Hue—10YR
Value—3 to 5
Chroma—1 or 2
Texture—silt loam

2Ab horizon:
Hue—10YR or N
Value—2 or 3
Chroma—0 or 1
Texture—silt loam or silty clay loam

2B horizon:
Hue—10YR, 5Y, or N
Value—3
Chroma—0 or 1
Texture—silty clay or silty clay loam

257—Uturin silt loam, 0 to 2 percent slopes, occasionally flooded

Composition

Uturin and similar soils: 100 percent

Setting

Landform: Flood plains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 60 inches
Drainage class: Poorly drained
Dominant parent material: Silty alluvium over clayey alluvium
Frequency of flooding: Occasional
Water table depth: At the surface to 1 foot below the surface
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 9.6 inches (high)
Content of organic matter in the surface layer: About 0.75 percent (low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Vore Series

Drainage class: Moderately well drained
Permeability: Moderate in the upper part and rapid in the lower part
Landform: Flood plains (bar area and young bottom land)
Parent material: Silty alluvium over sandy alluvium

Native vegetation: Mixed prairie grasses and deciduous trees
Slope range: 0 to 2 percent

Typical Pedon

Vore silty clay loam, 0 to 2 percent slopes, occasionally flooded, 1,690 feet south and 910 feet east of the northwest corner of sec. 6, T. 82 N., R. 45 W.; U.S.G.S. Topographic Quadrangle Tekamah NW, Iowa; lat. 41 degrees 56 minutes 46 seconds N. and long. 96 degrees 08 minutes 02 seconds W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; weak fine and medium subangular blocky structure parting to weak fine granular; friable; few fine roots throughout; few fine discontinuous tubular pores; few fine irregular dark nodules; strongly effervescent; slightly alkaline; clear smooth boundary.
C1—8 to 24 inches; dark grayish brown (2.5Y 4/2) and grayish brown (2.5Y 5/2) silty clay loam; few fine distinct dark gray (10YR 4/1) redox depletions; massive with evidence of parting along planes of weakness; friable; few fine roots throughout; few fine discontinuous tubular pores; strongly effervescent; slightly alkaline; abrupt smooth boundary.
2C2—24 to 60 inches; grayish brown (10YR 5/2) and light olive brown (2.5Y 5/4) loamy fine sand; few fine faint yellowish brown (10YR 5/6) redox concentrations; single grained; loose; few fine irregular dark nodules; slightly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the solum: 6 to 9 inches
Thickness of the mollic epipedon: 6 to 9 inches
Depth to carbonates: 0 to 9 inches

Ap or A horizon:
Hue—10YR or 2.5Y
Value—3
Chroma—1 or 2
Texture—silty clay loam

C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—silty clay loam

2C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—loamy fine sand or fine sand

516—Vore silty clay loam, 0 to 2 percent slopes, rarely flooded

Composition

Vore and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains (young bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay loam
Depth to bedrock: More than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Silty alluvium over sandy alluvium
Frequency of flooding: Rare
Depth to the water table: 3 to 5 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 7.1 inches (moderate)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Grable and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

1516—Vore silty clay loam, 0 to 2 percent slopes, occasionally flooded

Composition

Vore and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flood plains (bar area)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay loam
Depth to bedrock: More than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Silty alluvium over sandy alluvium
Frequency of flooding: Occasional
Depth to the water table: 3 to 5 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 7.1 inches (moderate)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Grable and similar soils
- Moderately well drained soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

W—Water

Component Description

- This map unit consists of natural bodies of water.

Woodbury Series

Drainage class: Poorly drained
Permeability: Slow
Landform: Flood plains (old bottom land)
Parent material: Clayey alluvium
Native vegetation: Mixed prairie grasses and deciduous trees
Slope range: 0 to 2 percent

Typical Pedon

Woodbury silty clay, 0 to 2 percent slopes, rarely flooded, in a cultivated field; 2,480 feet south and 1,500 feet west of the center of sec. 6, T. 84 N., R. 45 W.; U.S.G.S. Topographic Quadrangle Onawa, Iowa; lat. 42 degrees 07 minutes 16 seconds N. and long. 96 degrees 07 minutes 49 seconds W.

Ap—0 to 9 inches; black (10YR 2/1) silty clay, very dark grayish brown (10YR 4/2) dry; weak very fine granular structure; firm; slightly acid; abrupt smooth boundary.
A1—9 to 19 inches; black (10YR 2/1) silty clay, very dark gray (10YR 4/2) dry; weak fine granular structure; firm; neutral; clear smooth boundary.
A2—19 to 24 inches; very dark gray (10YR 3/1) silty clay, dark gray (10YR 4/2) dry; few fine distinct yellowish brown (10YR 5/6) redox concentrations; weak fine subangular blocky structure; firm; neutral; clear smooth boundary.
Bg—24 to 36 inches; olive gray (5Y 4/2) silty clay; common fine distinct olive brown (2.5Y 4/4) redox concentrations; weak fine prismatic structure parting to weak medium subangular blocky; firm; very dark gray (10YR 3/1) coatings on faces of peds; neutral; gradual smooth boundary.
BCg—36 to 46 inches; olive gray (5Y 5/2) silty clay loam; common fine distinct light olive brown (2.5Y 5/6) redox concentrations; weak fine prismatic structure; friable; slightly alkaline; gradual smooth boundary.
Cg—46 to 60 inches; olive brown (2.5Y 4/4) and olive gray (5Y 5/2) silty clay loam; massive with evidence of parting along planes of weakness; friable; few fine and medium rounded carbonate nodules and few fine rounded dark concretions; slightly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the solum: 36 to 48 inches
Thickness of the mollic epipedon: 16 to 24 inches
Depth to carbonates: 36 to 60 inches

Ap and A horizons:
Hue—10YR
Value—2 or 3
Chroma—1
Texture—silty clay

Bg horizon:
Hue—2.5Y or 5Y
Value—4

Chroma—2
Texture—silt loam

Cg horizon:
Hue—2.5Y or 5Y
Value—4 or 5
Chroma—2 to 4
Texture—silty clay loam; silt loam below a depth of 40 inches

67—Woodbury silty clay, 0 to 2 percent slopes, rarely flooded

Composition

Woodbury and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains (old bottom land)
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay
Depth to bedrock: More than 60 inches
Drainage class: Poorly drained
Dominant parent material: Clayey alluvium
Frequency of flooding: Rare
Water table depth: At the surface to 1 foot below the surface
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 9.1 inches (high)
Content of organic matter in the surface layer: About 6 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Luton and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

Zook Series

Drainage class: Poorly drained
Permeability: Slow
Landform: Flood plains
Parent material: Clayey alluvium
Native vegetation: Prairie
Slope range: 0 to 2 percent

Typical Pedon

Zook silty clay loam, 0 to 2 percent slopes, occasionally flooded, 1,200 feet east and 1,630 feet north of the southwest corner of sec. 16, T. 85 N., R. 44 W.; U.S.G.S. Topographic Quadrangle Smithland, Iowa; lat. 42 degrees 10 minutes 22 seconds N. and long. 95 degrees 58 minutes 37 seconds W.

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; few fine roots throughout; slightly acid; abrupt smooth boundary.
A1—8 to 18 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; few fine faint dark brown (7.5YR 3/4) iron concentrations; weak very fine subangular blocky structure; friable; few fine roots throughout; neutral; gradual smooth boundary.
A2—18 to 30 inches; black (10YR 2/1) silty clay loam; few fine faint dark brown (7.5YR 3/4) iron concentrations; massive fine and very fine subangular blocky structure; firm; few fine roots throughout; neutral; gradual smooth boundary.
A3—30 to 40 inches; very dark gray (10YR 3/1) silty clay; common fine faint dark brown (7.5YR 3/4) iron concentrations; moderate very fine and fine subangular blocky structure; firm; black (10YR 2/1) coatings on faces of peds; few fine roots throughout; neutral; gradual smooth boundary.
Bg1—40 to 50 inches; very dark gray (10YR 3/1) silty clay loam; common fine faint brown (7.5YR 4/4) redox concentrations; moderate very fine and fine prismatic structure; firm; few fine roots throughout; neutral; gradual smooth boundary.
Bg2—50 to 60 inches; very dark gray (10YR 3/1) silty clay; common fine faint brown (7.5YR 4/4) redox concentrations; moderate very fine and fine prismatic structure; firm; few fine roots throughout; neutral; gradual smooth boundary.
Cg—60 to 80 inches; very dark gray (10YR 3/1) silty clay loam; common fine faint brown (7.5YR 4/4) redox concentrations; massive with vertical parting; friable; slightly alkaline.

Range in Characteristics

Thickness of the solum: 36 to 60 inches

Thickness of the mollic epipedon: 36 to 50 inches
Depth to carbonates: 50 to more than 60 inches

Ap and upper part of A horizon:
Hue—10YR or N
Value—2
Chroma—0 or 1
Texture—silty clay loam

Lower part of A horizon:
Hue—10YR or N
Value—2 or 3
Chroma—0 or 1
Texture—silty clay loam or silty clay

Bg horizon:
Hue—10YR to 5Y
Value—2 to 5
Chroma—1
Texture—silty clay loam or silty clay

Cg horizon:
Hue—10YR to 5Y
Value—2 to 5
Chroma—1
Texture—silty clay loam or silty clay

54—Zook silty clay loam, 0 to 2 percent slopes, occasionally flooded

Composition

Zook and similar soils: 100 percent

Setting

Landform: Flood plains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay loam
Depth to bedrock: More than 80 inches
Drainage class: Poorly drained
Dominant parent material: Clayey alluvium
Frequency of flooding: Occasional
Water table depth: At the surface to 1 foot below the surface
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 11.1 inches (high)
Content of organic matter in the surface layer: About 6 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

54+—Zook silt loam, 0 to 2 percent slopes, occasionally flooded, overwash

Composition

Zook and similar soils: 100 percent

Setting

Landform: Flood plains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: More than 80 inches
Drainage class: Poorly drained
Dominant parent material: Clayey alluvium
Frequency of flooding: Occasional
Water table depth: At the surface to 1 foot below the surface
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 9.5 inches (high)
Content of organic matter in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- “Agronomy” section

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Glossary

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Alpha,alpha-dipyridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redoximorphic feature.

Animal unit month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Backslope. The position that forms the steepest and generally linear, middle portion of a hillslope (fig. 12). In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope. A geomorphic component of hills (fig. 12) consisting of the concave to linear (perpendicular to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Beach deposits. Material, such as sand and gravel, that is generally laid down parallel to an active or relict shoreline of a post-glacial or glacial lake.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bench (structural). A platformlike, nearly level to gently inclined erosional surface developed in resistant strata in areas where valleys are cut in alternating strong and weak layers that are essentially horizontal.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A shallow depression from which all or most of the soil material has been removed by the wind.

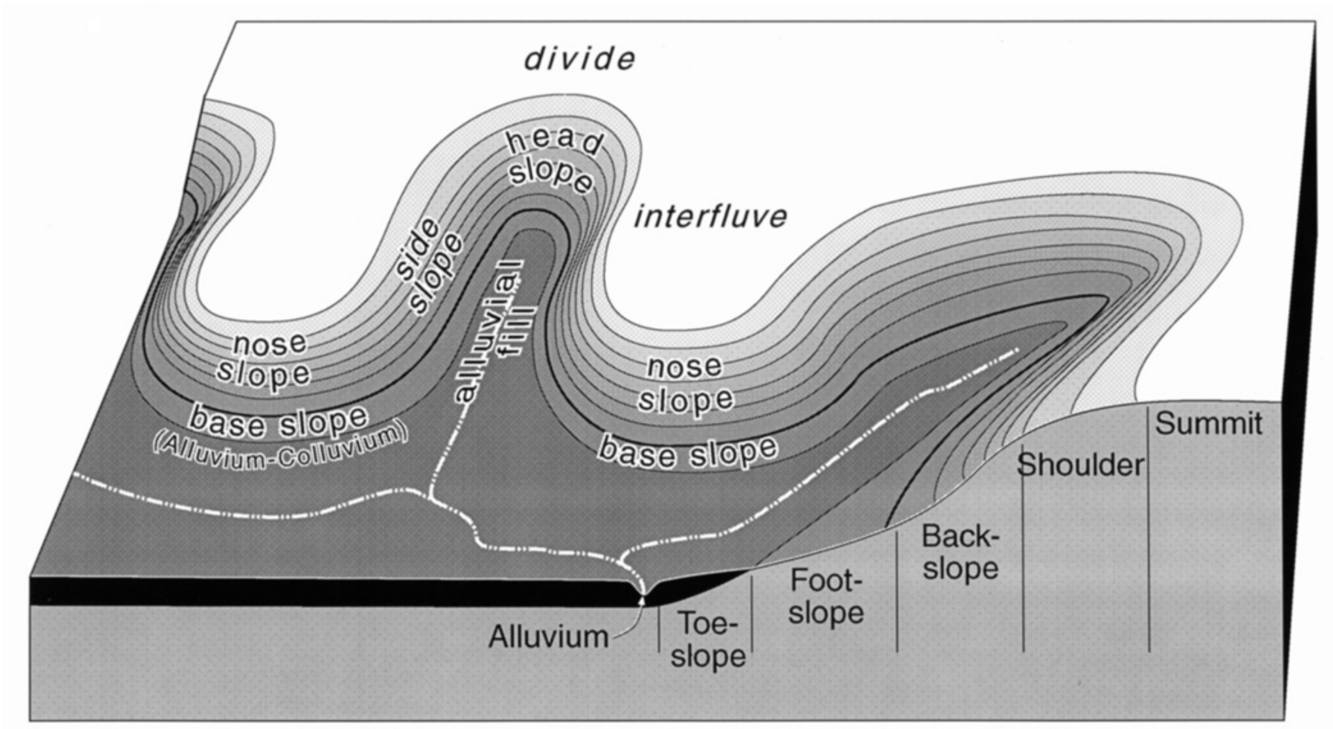

Figure 12.—Landscape relationship of geomorphic components and hillslope positions (modified after Ruhe and Walker, 1968).

A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or “chain,” of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

Channery soil material. Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the “Soil Survey Manual.”

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to

improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Delta. A body of alluvium having a surface that is nearly flat and fan shaped; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divide. (a) The line of separation, or (b) the summit area, or narrow tract of higher ground that constitutes the watershed boundary between two adjacent drainage basins (fig. 12); it divides the surface waters that flow naturally in one direction from those that flow in the opposite direction.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—***excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,*** and ***very poorly drained***. These classes are defined in the “Soil Survey Manual.”

Drainage, surface. Runoff, or surface flow of water, from an area.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic

processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.

Esker. A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fan terrace. A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called ***normal field capacity, normal moisture capacity,*** or ***capillary capacity***.

Fine textured soil. Sandy clay, silty clay, or clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flaggy soil material. Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Flood-plain splay. A fan-shaped deposit or other outspread deposit formed where an overloaded stream breaks through a levee (natural or artificial) and deposits its material (commonly coarse grained) on the flood plain.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Footslope. The position that forms the inner, gently inclined surface at the base of a hillslope (fig. 12). In profile, footslopes are commonly concave. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Geomorphology. The science that treats the general configuration of the earth's surface; specifically the study of the classification, description, nature, origin, and development of landforms and their relationships to underlying structures, and the history of geologic changes as recorded by these surface features. The term is especially applied to the genetic interpretation of landforms.

Glacial drift. Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits. Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head slope. A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway (fig. 12). The overland waterflow is converging.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-chroma zones. Zones having chroma of 3 or more. Typical color in areas of iron concentrations.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the “Soil Survey Manual.” The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material.

The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Ice-walled lake plain. A relict surface marking the floor of an extinct lake basin that was formed on solid ground and surrounded by stagnant ice in a stable or unstable superglacial environment on stagnation moraines. As the ice melted, the lake plain became perched above the adjacent landscape. The lake plain is well sorted, generally fine textured, stratified deposits.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Interfluve. An elevated area between two drainageways that sheds water to those drainageways (fig. 12).

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Iron concentrations. High-chroma zones having a high content of iron and manganese oxide because of chemical oxidation and accumulation, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic concentration.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or

into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame. An irregular, short ridge or hill of stratified glacial drift.

Kame moraine. An end moraine that contains numerous kames. A group of kames along the front of a stagnant glacier, commonly comprising the slumped remnants of a formerly continuous outwash plain built up over the foot of rapidly wasting or stagnant ice.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake bed. The bottom of a lake; a lake basin.

Lake plain. A nearly level surface marking the floor of an extinct lake filled by well sorted, generally fine textured, stratified deposits, commonly containing varves.

Lakeshore. A narrow strip of land in contact with or bordering a lake; especially the beach of a lake.

Lake terrace. A narrow shelf, partly cut and partly built, produced along a lakeshore in front of a scarp line of low cliffs and later exposed when the water level falls.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low-chroma zones. Zones having chroma of 2 or less. Typical color in areas of iron depletions.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Meander scroll. One of a series of long, parallel, close fitting, crescent-shaped ridges and troughs formed along the inner bank of a stream meander as the channel migrated laterally down-valley and toward the outer bank.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine. An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—***few, common,*** and ***many;*** size—***fine, medium,*** and ***coarse;*** and contrast—***faint, distinct,*** and ***prominent***. The size measurements are of the diameter along the greatest dimension. ***Fine*** indicates less than 5 millimeters (about 0.2 inch); ***medium,*** from 5 to 15 millimeters (about 0.2 to 0.6 inch); and ***coarse,*** more than 15 millimeters (about 0.6 inch).

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon. A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Nose slope. A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside (fig. 12). The overland waterflow is predominantly divergent.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Paleoterrace. An erosional remnant of a terrace that retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to, a present-day stream or drainage network.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, ***hardpan, fragipan, claypan, plowpan,*** and ***traffic pan***.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Parts per million (ppm). The concentration of a substance in the soil, such as phosphorus or potassium, in one million parts of air-dried soil on a weight per weight basis.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment. A thin layer of alluvial material that mantles an erosion surface and has been transported to its present position from higher lying areas of the erosion surface.

Pedon. The smallest volume that can be called “a soil.” A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as “saturated hydraulic conductivity,” which is defined in the

"Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

Impermeable	less than 0.0015 inch
Very slow	0.0015 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Phosphorus. The amount of phosphorus available to plants at a depth of 30 to 42 inches is expressed in parts per million and based on the weighted average of air-dried soil samples. Terms describing the amount of available phosphorus are:

Very low	less than 7.5 ppm
Low	7.5 to 13.0 ppm
Medium	13.0 to 22.5 ppm
High	more than 22.5 ppm

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitted outwash plain. An outwash plain marked by many irregular depressions, such as kettles, shallow pits, and potholes, which formed by melting of incorporated ice masses.

Pitting (in tables). Pits caused by melting around ice. They form on the soil after plant cover is removed.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plateau. An extensive upland mass with relatively flat summit area that is considerably elevated (more than 100 meters) above adjacent lowlands and separated from them on one or more sides by escarpments.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potassium. The amount of potassium available to plants at a depth of 12 to 24 inches is expressed in parts per million and based on the weighted average of air-dried soil samples. Terms describing the amount of available potassium are:

Very low	less than 50 ppm
Low	50 to 79 ppm
Medium	79 to 125 ppm
High	more than 125 ppm

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8

Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saprolite. Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Second bottom. The first terrace above the normal flood plain (or first bottom) of a river.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shoulder. The position that forms the uppermost inclined surface near the top of a hillslope (fig. 12). It is a transition from backslope to summit. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Side slope. A geomorphic component of hills consisting of a laterally planar area of a hillside (fig. 12). The overland waterflow is predominantly parallel.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Sloughed till. Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodium adsorption ratio (SAR). A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief and by the passage of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stagnation moraine. A body of drift released by the melting of a glacier that ceased flowing. Commonly but not always occurs near ice margins; composed of till, ice-contact stratified drift, and small areas of glacial lake sediment. Typical landforms are knob-and-kettle topography, locally including ice-walled lake plains.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stream terrace. A platform or series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the

level of the stream, and representing the remnants of an abandoned flood plain, stream bed, or valley floor produced during a former stage of fluvial erosion or deposition.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—***platy*** (laminated), ***prismatic*** (vertical axis of aggregates longer than horizontal), ***columnar*** (prisms with rounded tops), ***blocky*** (angular or subangular), and ***granular***. ***Structureless*** soils are either ***single grained*** (each grain by itself, as in dune sand) or ***massive*** (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summit. The topographically highest position of a hillslope (fig. 12). It has a nearly level (planar or only slightly convex) surface.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Swale. A slight depression in the midst of generally level land. A shallow depression in an undulating ground moraine caused by uneven glacial deposition.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geomorphology). A steplike surface, bordering a valley floor or shoreline, that represents the former position of a flood plain, lakeshore, or seashore. The term is usually applied to both the relatively flat summit surface (tread), cut or built by stream or wave action, and the steeper descending slope (scarp or riser), graded to a lower base level of erosion.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are ***sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,*** and ***clay***. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Till plain. An extensive area of nearly level to undulating soils underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The position that forms the gently inclined surface at the base of a hillslope (fig. 12). Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The uprooting and tipping over of trees by the wind.

United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with Iowa Agriculture and Home Economics Experiment Station; Cooperative Extension Service, Iowa State University; and Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship

Soil Survey of Monona County, Iowa

Part II

How To Use This Soil Survey

This survey is divided into three parts. Part I includes general information about the survey area; descriptions of the general soil map units, detailed soil map units, and soil series in the area; and a description of how the soils formed. Part II describes the use and management of the soils and the major soil properties. This part may be updated as further information about soil management becomes available. Part III includes the maps.

On the **general soil map**, the survey area is divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map units in the area on the color-coded map legend, then refer to the section **General Soil Map Units** in Part I of this survey for a general description of the soils in your area.

The **detailed soil maps** can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**. Note the number of the map sheet, and turn to that sheet.

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Contents** or the **Numerical Index to Map Units** in Part I of this survey, which lists the map units and shows the page where each map unit is described.

The **Contents** in Part II shows which table has data on a specific land use for each detailed soil map unit. Also, see the **Contents** in Part I and Part II for other sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1994. Soil names and descriptions were approved in 1996. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1994. This survey was made cooperatively by the Natural Resources Conservation Service; the Iowa Agriculture and Home Economics Experiment Station; the Cooperative Extension Service, Iowa State University; and the Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship. The survey is part of the technical assistance furnished to the Monona County Soil and Water Conservation District. Funds appropriated by Monona County were used to defray part of the cost of the survey.

Cover: An area of Hamburg and Napier soils in Monona County. In the background are soils on bottom land along the Missouri River.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service homepage on the World Wide Web. The address is http://www.nrcs.usda.gov.

Contents

Issued 2002

Soil Survey of
Monona County, Iowa—Part II

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

This part of the soil survey includes interpretations for various uses of the soils and data on soil properties. This information can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Interpretive ratings help engineers, planners, and others understand how soil properties influence important nonagricultural uses, such as building site development and construction materials. The ratings indicate the most restrictive soil features affecting the suitability of the soils for these uses.

Soils are rated in their natural state. No unusual modification of the soil site or material is made other than that which is considered normal practice for the rated use. Even though soils may have limitations, it is important to remember that engineers and others can modify soil features or can design or adjust the plans for a structure to compensate for most of the limitations. Most of these practices, however, are costly. The final decision in selecting a site for a particular use generally involves weighing the costs of site preparation and maintenance.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

At the end of this section, table 1, table 2, and table 3 provide information about the climate in the survey area. The classification of the soils in the survey area is shown in table 4, and the extent of the soils is shown in table 5.

Table 1.--Temperature and Precipitation

(Recorded in the period 1961-90 at Onawa, Iowa)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	29.9	9.1	19.5	57	-22	0	0.59	0.17	0.93	1	7.3
February---	36.0	14.9	25.5	64	-18	0	.73	.25	1.13	1	7.0
March------	48.4	26.4	37.4	81	-3	28	2.17	.84	3.29	4	7.4
April------	64.3	38.8	51.5	90	17	147	2.75	1.41	3.92	6	1.4
May--------	74.8	50.2	62.5	94	28	396	4.10	2.57	5.49	7	.0
June-------	83.9	59.8	71.8	100	42	654	4.45	2.09	6.48	6	.0
July-------	87.8	64.5	76.1	101	48	810	3.69	1.89	5.26	5	.0
August-----	84.8	61.8	73.3	99	44	721	3.19	1.59	4.59	5	.0
September--	76.1	52.6	64.3	96	31	435	3.22	1.43	4.75	5	.0
October----	65.4	40.8	53.1	88	19	170	2.37	.73	3.70	4	.6
November---	48.1	27.7	37.9	72	2	16	1.22	.27	1.97	2	2.8
December---	33.1	14.1	23.6	61	-17	1	.89	.40	1.31	2	7.5
Yearly:											
Average---	61.0	38.4	49.7	---	---	---	---	---	---	---	---
Extreme---	---	---	---	102	-24	---	---	---	---	---	---
Total-----	---	---	---	---	---	3,378	29.38	22.66	34.78	48	33.9

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1961-90 at Onawa, Iowa)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 20	May 2	May 14
2 years in 10 later than--	Apr. 15	Apr. 27	May 9
5 years in 10 later than--	Apr. 6	Apr. 18	Apr. 29
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 10	Sept. 27	Sept. 22
2 years in 10 earlier than--	Oct. 16	Oct. 2	Sept. 27
5 years in 10 earlier than--	Oct. 26	Oct. 12	Oct. 5

Table 3.--Growing Season

(Recorded in the period 1961-90 at Onawa, Iowa)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	180	153	138
8 years in 10	188	161	145
5 years in 10	202	176	158
2 years in 10	217	191	172
1 year in 10	225	199	179

Table 4.--Classification of the Soils

Soil name	Family or higher taxonomic class
Ackmore	Aeric Fluvaquents, fine-silty, mixed, nonacid, mesic
Albaton	Vertic Fluvaquents, very fine, montmorillonitic (calcareous), mesic
Blake	Aquic Udifluvents, fine-silty, mixed (calcareous), mesic
Blencoe	Aquertic Hapludolls, clayey over loamy, montmorillonitic, mesic
Blend	Fluvaquentic Endoaquolls, fine, montmorillonitic, mesic
Burcham	Aquic Hapludolls, fine-silty over clayey, mixed, mesic
Castana	Entic Hapludolls, fine-silty, mixed, mesic
Colo	Cumulic Endoaquolls, fine-silty, mixed, mesic
Cooper	Fluvaquentic Hapludolls, fine-silty over clayey, mixed, mesic
Forney	Vertic Fluvaquents, fine, montmorillonitic, nonacid, mesic
Grable	Mollic Udifluvents, coarse-silty over sandy or sandy-skeletal, mixed (calcareous), mesic
Grantcenter	Aquic Hapludolls, fine-silty, mixed, mesic
Hamburg	Typic Udorthents, coarse-silty, mixed (calcareous), mesic
Haynie	Mollic Udifluvents, coarse-silty, mixed (calcareous), mesic
Hornick	Aquic Hapludolls, fine-silty over clayey, mixed, mesic
Ida	Typic Udorthents, fine-silty, mixed (calcareous), mesic
Keg	Typic Hapludolls, fine-silty, mixed, mesic
Kenmoor	Aquic Udifluvents, sandy over clayey, mixed (calcareous), mesic
Kennebec	Cumulic Hapludolls, fine-silty, mixed, mesic
Lakeport	Aquic Hapludolls, fine, montmorillonitic, mesic
Larpenteur	Aquic Hapludolls, fine-silty, mixed (calcareous), mesic
Lossing	Aquic Udifluvents, fine-silty, mixed (calcareous), mesic
Luton	Vertic Endoaquolls, very fine, montmorillonitic, mesic
McPaul	Mollic Udifluvents, coarse-silty, mixed (calcareous), mesic
Modale	Aquic Udifluvents, coarse-silty over clayey, mixed (calcareous), mesic
Monona	Typic Hapludolls, fine-silty, mixed, mesic
Morconick	Mollic Udifluvents, sandy, mixed (calcareous), mesic
Moville	Aquic Udifluvents, coarse-silty over clayey, mixed (calcareous), mesic
Napa	Typic Natraquerts, fine, montmorillonitic, mesic
Napier	Cumulic Hapludolls, fine-silty, mixed, mesic
Nishna	Cumulic Vertic Endoaquolls, fine, montmorillonitic (calcareous), mesic
Nodaway	Mollic Udifluvents, fine-silty, mixed, nonacid, mesic
Onawa	Aquic Udifluvents, clayey over loamy, montmorillonitic (calcareous), mesic
Owego	Mollic Fluvaquents, fine, montmorillonitic, nonacid, mesic
Percival	Aquic Udifluvents, clayey over sandy or sandy-skeletal, montmorillonitic (calcareous), mesic
Rawles	Mollic Udifluvents, fine-silty, mixed (calcareous), mesic
Rodney	Mollic Fluvaquents, fine-silty over clayey, mixed (calcareous), mesic
Salix	Typic Hapludolls, fine-silty, mixed, mesic
Sarpy	Typic Udipsamments, mixed, mesic
Scroll	Aquic Udifluvents, fine-silty over sandy or sandy-skeletal, mixed (calcareous), mesic
Smithland	Aquic Cumulic Hapludolls, fine-silty, mixed, mesic
Steinauer	Typic Udorthents, fine-loamy, mixed (calcareous), mesic
Ticonic	Typic Udifluvents, sandy over loamy, mixed (calcareous), mesic
Tieville	Vertic Endoaquolls, fine, montmorillonitic (calcareous), mesic
Uturin	Mollic Fluvaquents, fine-silty, mixed (calcareous), mesic
Vore	Aquic Udifluvents, fine-silty over sandy or sandy-skeletal, mixed (calcareous), mesic
Woodbury	Vertic Endoaquolls, fine, montmorillonitic, mesic
Zook	Cumulic Vertic Endoaquolls, fine, montmorillonitic, mesic

Table 5.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
1C	Ida silt loam, 5 to 9 percent slopes	2,316	0.5
1C3	Ida silt loam, 5 to 9 percent slopes, severely eroded	3,641	0.8
1D	Ida silt loam, 9 to 14 percent slopes	4,787	1.1
1D3	Ida silt loam, 9 to 14 percent slopes, severely eroded	10,424	2.3
1E	Ida silt loam, 14 to 20 percent slopes	4,804	1.1
1E3	Ida silt loam, 14 to 20 percent slopes, severely eroded	21,791	4.9
1F	Ida silt loam, 20 to 30 percent slopes	15,138	3.4
1F3	Ida silt loam, 20 to 30 percent slopes, severely eroded	11,090	2.5
1G	Ida silt loam, 30 to 40 percent slopes	8,622	1.9
2G	Hamburg silt loam, 40 to 75 percent slopes	5,295	1.2
3D	Castana silt loam, 9 to 14 percent slopes	1,918	0.4
3E	Castana silt loam, 14 to 20 percent slopes	9,853	2.2
3F	Castana silt loam, 20 to 30 percent slopes	913	0.2
10B	Monona silt loam, 2 to 5 percent slopes	825	0.2
10C	Monona silt loam, 5 to 9 percent slopes	844	0.2
10C2	Monona silt loam, 5 to 9 percent slopes, moderately eroded	13,614	3.0
10C3	Monona silt loam, 5 to 9 percent slopes, severely eroded	236	*
10D	Monona silt loam, 9 to 14 percent slopes	1,179	0.3
10D2	Monona silt loam, 9 to 14 percent slopes, moderately eroded	10,483	2.3
10D3	Monona silt loam, 9 to 14 percent slopes, severely eroded	1,783	0.4
10E	Monona silt loam, 14 to 20 percent slopes	1,018	0.2
10E2	Monona silt loam, 14 to 20 percent slopes, moderately eroded	5,220	1.2
10E3	Monona silt loam, 14 to 20 percent slopes, severely eroded	1,848	0.4
10F	Monona silt loam, 20 to 30 percent slopes	1,428	0.3
10F2	Monona silt loam, 20 to 30 percent slopes, moderately eroded	655	0.1
10F3	Monona silt loam, 20 to 30 percent slopes, severely eroded	415	*
10G	Monona silt loam, 30 to 40 percent slopes	595	0.1
12B	Napier silt loam, 2 to 5 percent slopes	8,984	2.0
12C	Napier silt loam, 5 to 9 percent slopes	34,888	7.8
12D	Napier silt loam, 9 to 14 percent slopes	16,906	3.7
17B	Napier-Kennebec-Colo complex, 0 to 5 percent slopes	2,477	0.5
33D	Steinauer clay loam, 9 to 14 percent slopes	15	*
33E	Steinauer clay loam, 14 to 18 percent slopes	166	*
33F	Steinauer clay loam, 18 to 25 percent slopes	293	*
33G	Steinauer clay loam, 25 to 40 percent slopes	210	*
36	Salix silty clay loam, 0 to 2 percent slopes, rarely flooded	8,877	2.0
44	Blencoe silty clay, 0 to 2 percent slopes, rarely flooded	6,707	1.5
46	Keg silt loam, 0 to 2 percent slopes, rarely flooded	1,763	0.4
54	Zook silty clay loam, 0 to 2 percent slopes, occasionally flooded	2,231	0.5
54+	Zook silt loam, 0 to 2 percent slopes, occasionally flooded, overwash	313	*
66	Luton silty clay, 0 to 1 percent slopes, rarely flooded	57,371	12.8
66+	Luton silt loam, 0 to 1 percent slopes, rarely flooded, overwash	523	0.1
67	Woodbury silty clay, 0 to 2 percent slopes, rarely flooded	7,034	1.6
68	Napa silty clay loam, 0 to 2 percent slopes, rarely flooded	361	*
70	McPaul silt loam, 0 to 2 percent slopes, rarely flooded	5,116	1.1
123	Grantcenter silty clay loam, 0 to 2 percent slopes, rarely flooded	4,433	1.0
133	Colo silty clay loam, 0 to 2 percent slopes, occasionally flooded	1,785	0.4
133+	Colo silt loam, 0 to 2 percent slopes, occasionally flooded, overwash	570	0.1
137	Haynie silt loam, 0 to 2 percent slopes, rarely flooded	4,791	1.1
144	Blake silty clay loam, 0 to 2 percent slopes, rarely flooded	3,078	0.7
145	Onawa silt loam, 0 to 2 percent slopes, rarely flooded	798	0.2
146	Onawa silty clay, 0 to 2 percent slopes, rarely flooded	9,907	2.2
147	Modale silty clay loam, 0 to 2 percent slopes, rarely flooded	1,078	0.2
149	Modale silt loam, 0 to 2 percent slopes, rarely flooded	1,919	0.4
155	Albaton silty clay loam, 0 to 2 percent slopes, rarely flooded	259	*
156	Albaton silty clay, 0 to 2 percent slopes, rarely flooded	14,148	3.2
157	Albaton silt loam, 0 to 2 percent slopes, rarely flooded	542	0.1
212	Kennebec silt loam, 0 to 2 percent slopes, occasionally flooded	6,327	1.4
212+	Kennebec silt loam, 0 to 2 percent slopes, occasionally flooded, overwash	2,143	0.5
220	Nodaway silt loam, 0 to 2 percent slopes, occasionally flooded	1,289	0.3
234	Nishna silty clay loam, 0 to 2 percent slopes, occasionally flooded	535	0.1
237	Sarpy loamy fine sand, 0 to 2 percent slopes, rarely flooded	1,020	0.2

See footnote at end of table.

Table 5.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
237B	Sarpy loamy fine sand, 2 to 5 percent slopes, rarely flooded	402	*
244	Blend silty clay, 0 to 2 percent slopes, rarely flooded	2,577	0.6
255	Cooper silty clay loam, 0 to 2 percent slopes, rarely flooded	2,583	0.6
257	Uturin silt loam, 0 to 2 percent slopes, occasionally flooded	188	*
266	Smithland silty clay loam, 0 to 2 percent slopes, occasionally flooded	2,160	0.5
275	Moville silt loam, 0 to 2 percent slopes, rarely flooded	1,375	0.3
366	Luton silty clay loam, 0 to 1 percent slopes, rarely flooded	2,283	0.5
430	Ackmore silt loam, 0 to 2 percent slopes, occasionally flooded	781	0.2
436	Lakeport silty clay loam, 0 to 2 percent slopes, rarely flooded	3,671	0.8
446	Burcham silt loam, 0 to 2 percent slopes, rarely flooded	180	*
465	Tieville silty clay, 0 to 2 percent slopes, rarely flooded	5,858	1.3
510	Monona silt loam, bench, 0 to 2 percent slopes	1,897	0.4
510B	Monona silt loam, bench, 2 to 5 percent slopes	4,578	1.0
510C	Monona silt loam, bench, 5 to 9 percent slopes	517	0.1
510C2	Monona silt loam, bench, 5 to 9 percent slopes, moderately eroded	2,137	0.5
510C3	Monona silt loam, bench, 5 to 9 percent slopes, severely eroded	110	*
514	Grable silt loam, 0 to 2 percent slopes, rarely flooded	1,900	0.4
515	Percival silty clay, 0 to 2 percent slopes, rarely flooded	1,980	0.4
516	Vore silty clay loam, 0 to 2 percent slopes, rarely flooded	675	0.2
552	Owego silty clay, 0 to 2 percent slopes, rarely flooded	4,052	0.9
553	Forney silty clay, 0 to 2 percent slopes, rarely flooded	8,106	1.8
670	Rawles silt loam, 0 to 2 percent slopes, occasionally flooded	6,480	1.4
717D	Napier-Gullied land complex, 5 to 14 percent slopes	1,863	0.4
746	Lossing silty clay, 0 to 2 percent slopes, rarely flooded	5,767	1.3
747	Rodney silty clay, 0 to 2 percent slopes, rarely flooded	1,656	0.4
748	Hornick silty clay, 0 to 2 percent slopes, rarely flooded	1,495	0.3
754	Larpenteur silt loam, 0 to 2 percent slopes, rarely flooded	1,809	0.4
945	Albaton silty clay, depressional, drained, 0 to 1 percent slopes, frequently flooded	638	0.1
946	Albaton silty clay, depressional, undrained, 0 to 1 percent slopes, frequently flooded	1,887	0.4
1137	Haynie silt loam, 0 to 2 percent slopes, occasionally flooded	1,415	0.3
1144	Blake silty clay loam, 0 to 2 percent slopes, occasionally flooded	694	0.2
1145	Onawa silt loam, 0 to 2 percent slopes, occasionally flooded	197	*
1146	Onawa silty clay, 0 to 2 percent slopes, occasionally flooded	2,547	0.5
1147	Modale silty clay loam, 0 to 2 percent slopes, occasionally flooded	80	*
1150	Modale silt loam, 0 to 2 percent slopes, occasionally flooded	225	*
1155	Albaton silty clay loam, 0 to 2 percent slopes, occasionally flooded	50	*
1156	Albaton silty clay, 0 to 2 percent slopes, occasionally flooded	3,401	0.8
1157	Albaton silt loam, 0 to 2 percent slopes, occasionally flooded	206	*
1220	Nodaway silt loam, channeled, 0 to 2 percent slopes	670	0.2
1237	Sarpy loamy fine sand, 0 to 2 percent slopes, occasionally flooded	1,714	0.4
1237B	Sarpy loamy fine sand, 2 to 5 percent slopes, occasionally flooded	1,092	0.2
1514	Grable silt loam, 0 to 2 percent slopes, occasionally flooded	1,315	0.3
1515	Percival silty clay, 0 to 2 percent slopes, occasionally flooded	2,752	0.6
1516	Vore silty clay loam, 0 to 2 percent slopes, occasionally flooded	989	0.3
1524	Morconick very fine sandy loam, 0 to 2 percent slopes, occasionally flooded	1,376	0.3
1525	Scroll silty clay, 0 to 2 percent slopes, occasionally flooded	1,008	0.2
1526	Scroll silty clay loam, 0 to 2 percent slopes, occasionally flooded	298	*
1552	Owego silty clay, 0 to 2 percent slopes, occasionally flooded	108	*
1746	Lossing silty clay, 0 to 2 percent slopes, occasionally flooded	760	0.2
1747	Rodney silty clay, 0 to 2 percent slopes, occasionally flooded	74	*
1750	Ticonic fine sand, 0 to 2 percent slopes, occasionally flooded	561	0.1
1849	Kenmoor fine sandy loam, 0 to 2 percent slopes, occasionally flooded	336	*
5010	Pits, sand and gravel	123	*
5040	Orthents, loamy	321	*
5044	Fluvaquents, frequently flooded	677	0.2
5045	Aquents, loamy, rarely flooded	334	*
5046	Aquents, ponded, rarely flooded	186	*
5047	Aquents, ponded, occasionally flooded	264	*
5051	Fluvaquents, ponded	121	*
5090	Aquents-Orthents complex	175	*
AW	Animal waste	2	*

See footnote at end of table.

Table 5.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
SL	Sewage lagoon	28	*
W	Water	4,004	0.9
	Total	447,300	100.0

* Less than 0.1 percent.

Agronomy

General management needed for crops and for hay and pasture is suggested in this section. The system of land capability classification used by the Natural Resources Conservation Service is explained, the estimated yields of the main crops and hay and pasture plants are listed for each soil, and prime farmland is described.

Planners of management systems for individual fields or farms should consider obtaining specific information from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Cropland Management Considerations

The management concerns affecting the use of the detailed map units in the survey area for crops are shown in table 6. The main concerns in managing nonirrigated cropland are conserving moisture, controlling wind erosion and water erosion, and maintaining soil fertility.

Conserving moisture consists primarily of reducing the evaporation and runoff rates and increasing the water infiltration rate. Applying conservation tillage and conservation cropping systems, farming on the contour, stripcropping, establishing field windbreaks, and leaving crop residue on the surface conserve moisture.

Generally, a combination of several practices is needed to control ***wind erosion*** and ***water erosion***. Conservation tillage, stripcropping, field windbreaks, contour farming, conservation cropping systems, crop residue management, terraces (fig. 13), diversions, and grassed waterways help to prevent excessive soil loss.

Measures that are effective in maintaining ***soil fertility*** include applying fertilizer, both organic and inorganic, including manure; incorporating crop residue or green manure crops into the soil; and using proper crop rotations. Controlling erosion helps to prevent the loss of organic matter and plant nutrients and thus helps to maintain productivity, although the level of fertility can be reduced even in areas where erosion is controlled. All soils used for nonirrigated crops respond well to applications of fertilizer.

Some of the considerations shown in the table cannot be easily overcome. These are ***channels, flooding, gullies,*** and ***ponding***.

Additional considerations are as follows:

Lime content, limited available water capacity, limited organic matter content, potential poor tilth and compaction, and ***restricted permeability***.—These limitations can be minimized by incorporating green manure crops, manure, or crop residue into the soil; applying a system of conservation tillage; and using conservation cropping systems. Also, crops may respond well to additions of phosphate fertilizer to soils that have a high content of lime.

Potential for ground-water contamination.—The proper use of nutrients and pesticides can reduce the risk of ground-water contamination.

Potential for surface-water contamination.—The risk of surface-water contamination can be reduced by the proper use of nutrients and pesticides and by conservation farming practices that reduce the runoff rate.

Surface crusting.—This limitation retards seeding development after periods of heavy rainfall.

Surface rock fragments.—This limitation causes rapid wear of tillage equipment. It cannot be easily overcome.

Surface stones.—Stones or boulders on or near the surface can hinder normal tillage unless they are removed.

Salt content.—In areas where this is a limitation, only salt-tolerant crops should be grown.

On irrigated soils the main management concerns are ***efficient water use, nutrient management, control of erosion, pest and weed control,*** and ***timely planting and harvesting*** for a successful crop. An irrigation system that provides optimum control and distribution of water at minimum cost is needed. Overirrigation wastes water, leaches plant nutrients, and causes erosion. Also, it can create drainage problems, raise the water table, and increase soil salinity.

Figure 13.—Grassed backslope terraces help to control erosion in areas of Monona soils.

Explanation of Criteria

Acid soil.—The pH is less than 6.1.

Channeled.—The word “channeled” is included in the map unit name.

Dense layer.—The bulk density is 1.80 g/cc or greater within the soil profile.

Depth to rock.—The depth to bedrock is less than 40 inches.

Excessive permeability.—Permeability is 6 inches per hour or more within the soil profile.

Flooding.—Flooding is occasional or frequent.

Gullied.—The word “gullied” is included in the map unit name.

High organic matter content.—The surface layer has more than 20 percent organic matter.

Lime content.—The pH is 7.4 or more in the surface layer, or the wind erodibility group is 4L.

Limited available water capacity.—The available water capacity calculated to a depth of 60 inches or to a root-limiting layer is 6 inches or less.

Limited organic matter content.—The content of organic matter is 2 percent or less in the surface layer.

Ponding.—Ponding duration is assigned to the map unit component. The water table is above the surface.

Potential poor tilth and compaction.—The content of clay is 27 percent or more in the surface layer.

Potential for ground-water contamination (by nutrients or pesticides).—Depth to the water table is 4 feet or less, the permeability of any layer is more than 6.0 inches per hour, or the depth to bedrock is less than 60 inches.

Potential for surface-water contamination (by nutrients or pesticides).—The map unit component is occasionally flooded or frequently flooded, is subject to ponding, is assigned to hydrologic group C or D and has a slope of more than 2 percent, is assigned to hydrologic group A and has a slope of more than 6

percent, or is assigned to hydrologic group B, has a slope of 3 percent or more, and has a K factor of more than 0.17.

Previously eroded.—The word “eroded” is included in the map unit name.

Restricted permeability.—Permeability is less than 0.06 inch per hour within the soil profile.

Salt content.—The electrical conductivity is 4 or more in the surface layer or 8 or more within a depth of 30 inches.

Slope (equipment limitation).—The slope is more than 15 percent.

Surface rock fragments (equipment limitation).—The terms describing the texture of the surface layer include any rock fragment modifier, except for gravelly, channery, stony, very stony, extremely stony, bouldery, very bouldery, and extremely bouldery.

Surface stones (equipment limitation).—The word “stony” or “bouldery” is included in the map unit name or in the description of the surface layer.

Water erosion.—Either the slope is 6 percent or more, or the slope is more than 3 percent and less than 6 percent and the surface layer is not sandy.

Water table.—A water table is within 2.5 feet of the surface.

Wind erosion.—The wind erodibility group is 1, 2, 3, or 4L.

Agronomic Considerations

Inherent subsoil fertility levels, in terms of potential plant-available phosphorus and potassium, are described in table 7. Soil tests of the tilled layer are used to determine the most profitable rates of fertilizers for various crops. Nutrient levels in the subsurface layers do influence crop yields, particularly in the drier seasons when the nutrients in the dry tilled layer become temporarily unavailable to plants. The availability of nutrients in the tilled layer and the subsoil influences the relative uptake from the two zones in the soil profile. Fertilizer recommendations based on soil tests of the tilled layer may be adjusted by the average nutrient levels in the subsoil of each soil series. Fertilizer recommendations are adjusted for subsoil nutrient levels. The ratings given in the table are described as follows:

Subsoil phosphorus.—The amount of plant-available phosphorus in the subsoil expressed in parts per million and based on the weighted average of air-dried soil samples from the subsoil (at a depth of 30 to 42 inches). (The value listed for complexes is the most limiting value of the soils identified in the map unit name.) A rating of ***very low*** indicates less than 7.5 ppm; ***low***, 7.5 to 13.0 ppm; ***medium***, 13.0 to 22.5 ppm; and ***high***, more than 22.5 ppm.

Subsoil potassium.—The amount of plant-available potassium in the subsoil expressed in parts per million and based on the weighted average of air-dried soil samples from the subsoil (at a depth of 12 to 24 inches). (The value listed for complexes is the most limiting value of the soils identified in the map unit name.) A rating of ***very low*** indicates less than 50 ppm; ***low***, 50 to 79 ppm; ***medium***, 79 to 125 ppm; and ***high***, more than 125 ppm.

Tilth rating.—The ratings of ***good, fair, poor,*** and ***very poor*** are based on clay content, organic matter content, drainage class, sand size, and sand content.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland or for engineering purposes.

In the capability system, soils generally are grouped at three levels—capability class, subclass, and unit (USDA, 1961). These categories indicate the degree and kinds of limitations affecting mechanized farming systems that produce the more commonly grown field crops, such as corn, small grain, cotton, hay, and field-grown vegetables. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use.

If properly managed, soils in classes 1, 2, 3, and 4 are suitable for the mechanized production of commonly grown field crops and for pasture and woodland. The degree of the soil limitations affecting the production of cultivated crops increases progressively from class 1 to class 4. The limitations can affect levels of production and the risk of

permanent soil deterioration caused by erosion and other factors.

Soils in classes 5, 6, and 7 are generally not suited to the mechanized production of commonly grown field crops without special management, but they are suitable for plants that provide a permanent cover, such as grasses and trees. The severity of the soil limitations affecting crops increases progressively from class 5 to class 7.

Areas in class 8 are generally not suitable for crops, pasture, or woodland without a level of management that is impractical. These areas may have potential for other uses, such as recreational facilities and wildlife habitat.

Capability subclasses identify the dominant kind of limitation in the class. They are designated by adding a small letter, ***e, w, s,*** or ***c***, to the class numeral, for example, 2e. The letter ***e*** shows that the main hazard is the risk of erosion unless a close-growing plant cover is maintained; ***w*** shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); ***s*** shows that the soil is limited mainly because it is shallow, droughty, or stony; and ***c***, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

There are no subclasses in class 1 because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by ***w, s,*** or ***c*** because the soils in class 5 are subject to little or no erosion. They have other limitations that restrict their use mainly to pasture, woodland, wildlife habitat, or recreation.

The capability classification of each map unit is given in table 8, table 9, and table 10 at the end of this section.

Corn Suitability Rating (CSR)

The corn suitability rating for the soils in the survey area is given in table 8. Corn suitability ratings provide a relative ranking of all soils mapped in the State of Iowa based on their potential to be utilized for the intensive production of row crops. The CSR is an index that can be used to rate the potential production of one soil compared with another over a period of time. The CSR considers average weather conditions and frequency of use of the soil for row crops. Ratings range from 100 for soils that have no physical limitations, are on minimal slopes, and can be continuously row cropped to as low as 5 for soils that have severe limitations affecting the production of row crops. The ratings listed in this table assume adequate management, natural weather conditions (no irrigation), artificial drainage where required, and no land leveling or terracing. They also assume that soils in the lower positions on the landscape are not affected by frequent damaging floods. The weighted CSR for a given field can be modified by the occurrence of sandy spots, local deposits, rock and gravel outcrops, field boundaries, and noncrossable drainageways. Even though predicted average yields will change with time, the CSR's are expected to remain relatively constant in relation to one another.

The CSR's in Monona County range from 90 for Keg silt loam, 0 to 2 percent slopes, rarely flooded, to 5 for several map units, including Sarpy loamy fine sand, 0 to 2 percent slopes, rarely flooded. No ratings are provided for miscellaneous areas or for such map units as Fluvaquents, ponded, because of the variability of properties and uses of these soils.

Crop Yield Estimates

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 8, table 9, and table 10. In any given year, yields may be higher or lower than those indicated in the tables because of variations in rainfall and other climatic factors. The land capability classification of map units in the county also is shown in the tables.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations also are considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

For yields of irrigated crops (table 10), it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good-quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared

with that of other soils, however, is not likely to change.

Crops other than those shown in the tables are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Pasture and Hayland Interpretations

Under good management, proper grazing is essential for the production of high-quality forage, stand survival, and erosion control (fig. 14). Proper grazing helps plants to maintain sufficient and generally vigorous top growth during the growing season. Brush control is essential in many areas, and weed control generally is needed. Rotation grazing and renovation also are important management practices.

Some of the yield estimates in table 9 are provided in animal unit months (AUM), or the amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about forage yields other than those shown in table 9.

Prime Farmland

Prime farmland is of major importance in meeting the Nation's short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, State, and Federal levels, as well as individuals, must encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to food, feed, forage, fiber, and oilseed crops. Such soils have properties that favor the economic production of sustained high yields of crops. The soils need only to be treated and managed by acceptable farming methods. An adequate moisture supply and a sufficiently long growing season are required. Prime farmland soils produce the highest yields with minimal expenditure of energy and economic resources, and farming these soils results in the least damage to the environment.

Prime farmland soils may presently be used as cropland, pasture, or woodland or for other purposes. They either are used for food and fiber or are available for these uses. Urban or built-up land, public land, and water areas cannot be considered prime farmland. Urban or built-up land is any contiguous unit of land 10 acres or more in size that is used for such purposes as housing, industrial, and commercial sites, sites for institutions or public buildings, small parks, golf courses, cemeteries, railroad yards, airports, sanitary landfills, sewage treatment plants, and water-control structures. Public land is land not available for farming in National forests, National parks, military reservations, and State parks.

Prime farmland soils commonly receive an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable, and the level of acidity or alkalinity and the content of salts and sodium are acceptable. The soils have few, if any, rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods, and they are not frequently flooded during the growing season or are protected from flooding. Slopes range mainly from 0 to 6 percent.

Soils that have a high water table or are subject to flooding may qualify as prime farmland where these limitations are overcome by drainage measures or flood control. Onsite evaluation is necessary to determine the effectiveness of corrective measures. More information about the criteria for prime farmland can be obtained at the local office of the Natural Resources Conservation Service.

A recent trend in land use has been the conversion of prime farmland to urban and industrial uses. The loss of prime farmland to other uses puts pressure on lands that are less productive than prime farmland.

About 127,800 acres, or nearly 29 percent of the survey area, meets the requirements for prime farmland.

The map units in the survey area that meet the requirements for prime farmland are listed in table 11. This list does not constitute a recommendation for a particular land use. On some soils included in the table, measures that overcome limitations are needed. The need for these measures is indicated in parentheses after the map unit name. The location of each map unit is shown on the detailed soil maps. The soil qualities that affect use and management are described in the section "Soil Series and Detailed Soil Map Units" in Part I of this survey.

Erosion Factors

Soil erodibility (K) and soil-loss tolerance (T) factors are used in an equation that predicts the amount of soil lost through water erosion in areas of cropland.

Figure 14.—Catsteps are common in areas of Hamburg silt loam, 40 to 75 percent slopes. Catsteps are small, irregular terraces on steep hillsides, especially in pasture. They are formed by the trampling of cattle or the slippage of saturated soil.

The procedure for predicting soil loss is useful in guiding the selection of soil and water conservation practices. The erosion factors for the soils in the survey area are listed in table 22.

Soil Erodibility (K) Factor

The soil erodibility (K) factor indicates the susceptibility of a soil to sheet and rill erosion by water. The soil properties that influence erodibility are those that affect the infiltration rate, the movement of water through the soil, and the water storage capacity of the soil and those that allow the soil to resist dispersion, splashing, abrasion, and the transporting forces of rainfall and runoff. The most important soil properties are the content of silt plus very fine sand, the content of sand coarser than very fine sand, the content of organic matter, soil structure, and permeability.

Fragment-Free Soil Erodibility (Kf) Factor

This is one of the factors used in the revised Universal Soil Loss Equation. It shows the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Soil-Loss Tolerance (T) Factor

The soil-loss tolerance (T) factor is an estimate of the maximum annual rate of soil erosion that can occur over a sustained period without affecting crop productivity. The rate is expressed in tons of soil loss per acre per year. Ratings of 1 to 5 are used, depending on soil properties and prior erosion. The criteria used in assigning a T factor to a soil include maintenance of an adequate rooting depth for crop production, potential reduction of crop yields, maintenance of water-control structures affected by

sedimentation, prevention of gullying, and the value of nutrients lost through erosion.

Wind Erodibility Groups

Wind erodibility is directly related to the percentage of dry, nonerodible surface soil aggregates larger than 0.84 millimeter in diameter. From this percentage, the wind erodibility index (I) factor is determined. This factor is an expression of the stability of the soil aggregates, or the extent to which they are broken down by tillage and the abrasion caused by windblown soil particles. Soils are assigned to wind erodibility groups (WEG) having similar percentages of dry soil aggregates larger than 0.84 millimeter. The wind erodibility groups and wind erodibility index numbers are listed in table 22.

Additional information about wind erodibility groups and K, Kf, T, and I factors can be obtained from local offices of the Natural Resources Conservation Service or the Cooperative Extension Service.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Windbreaks are often planted on land that did not originally support trees. Knowledge of how trees perform on such land can be gained only by observing and recording the performance of trees that have been planted and have survived. Many popular windbreak species are not indigenous to the areas in which they are planted.

Each tree or shrub species has certain climatic and physiographic limits. Within these parameters, a tree or shrub may grow well or grow poorly, depending on the characteristics of the soil. Each tree or shrub has definable potential heights in a given physiographic area and under a given climate. Accurate definitions of potential heights are necessary when a windbreak is planned and designed.

Table 12 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in this table are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Natural Resources Conservation Service or the Cooperative Extension Service or from a nursery.

Windbreak Suitability Groups

Windbreak suitability groups consist of soils in which the kinds and degrees of the hazards and limitations that affect the survival and growth of trees and shrubs in windbreaks are about the same. The windbreak suitability groups for the soils in the survey area are listed in table 13. The following paragraphs explain the characteristics of the soils in each group.

Group 1 consists of soils that are somewhat poorly drained or moderately well drained, are rapidly permeable to moderately slowly permeable, and do not have free carbonates in the upper 20 inches.

Group 1K consists of soils that are somewhat poorly drained or moderately well drained, are rapidly permeable to moderately slowly permeable, and have free carbonates within 20 inches of the surface. These soils may be very slightly saline or slightly saline (the electrical conductivity is 2 to 8).

Group 2 consists of poorly drained soils that have been artificially drained and do not have free carbonates in the upper 20 inches. Permeability varies.

Group 2H consists of very poorly drained soils that have been artificially drained and have more than 16 inches of organic material. Permeability varies.

Group 2K consists of poorly drained or very poorly drained soils that have been artificially drained and have free carbonates within 20 inches of the surface. Permeability varies. These soils may be very slightly saline or slightly saline (the electrical conductivity is 2 to 8).

Group 2W consists of very poorly drained soils that are subject to ponding and have been artificially drained. It includes soils that have an organic surface layer up to 16 inches thick. Permeability varies.

Group 3 consists of soils that are well drained or moderately well drained and are loamy or silty throughout. Permeability is moderate or moderately slow. These soils do not have free carbonates in the upper 20 inches.

Group 4 consists of soils that are well drained, moderately well drained, or somewhat poorly drained and have a silty or loamy surface layer and a clayey subsoil. Permeability is slow or very slow.

Group 4C consists of soils that are well drained, moderately well drained, or somewhat poorly drained and have a clayey surface layer and subsoil. Permeability is slow or very slow.

Group 4F consists of soils that are well drained, moderately well drained, or somewhat poorly drained and have a substratum of dense till. Permeability is slow or very slow.

Group 5 consists of soils that are excessively drained to moderately well drained and have a moderate available water capacity. These soils are dominantly fine sandy loam or sandy loam, but some are sandy in the upper part and loamy in the lower part.

Group 6D consists of excessively drained to moderately well drained, loamy soils that have bedrock at a depth of 20 to 40 inches. These soils have a low or moderate available water capacity.

Group 6G consists of excessively drained to moderately well drained soils that are loamy in the upper part and have sand or sand and gravel at a depth of 20 to 40 inches. These soils have a low or moderate available water capacity.

Group 7 consists of excessively drained to well drained soils that are dominantly loamy fine sand or coarser textured and are shallow to sand or to sand and gravel. These soils have a low available water capacity.

Group 8 consists of excessively drained to well drained, loamy soils that have free carbonates within 20 inches of the surface.

Group 9W consists of soils that are somewhat poorly drained, poorly drained, or very poorly drained and are moderately saline (the electrical conductivity is 8 to 16).

Group 10 consists of soils or miscellaneous land types that generally are not suitable for windbreaks. One or more characteristics, such as soil depth, texture, wetness, available water capacity, or slope, limit the planting, survival, or growth of trees and shrubs.

Table 6.--Cropland Management Considerations

(See text for a description of the considerations listed in this table. Absence of an entry indicates that no rating is applicable)

Map symbol and soil name	Cropland management considerations
1C:	
Ida	Lime content Potential for surface-water contamination Water erosion Wind erosion
1C3:	
Ida	Lime content Limited organic matter content Potential for surface-water contamination Previously eroded Water erosion Wind erosion
1D:	
Ida	Lime content Potential for surface-water contamination Water erosion Wind erosion
1D3:	
Ida	Lime content Limited organic matter content Potential for surface-water contamination Previously eroded Water erosion Wind erosion
1E:	
Ida	Lime content Potential for surface-water contamination Slope Water erosion Wind erosion
1E3:	
Ida	Lime content Limited organic matter content Potential for surface-water contamination Previously eroded Slope Water erosion Wind erosion
1F:	
Ida	Lime content Potential for surface-water contamination Slope Water erosion Wind erosion

Table 6.--Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
1F3:	
Ida	Lime content Limited organic matter content Potential for surface-water contamination Previously eroded Slope Water erosion Wind erosion
1G:	
Ida	Lime content Potential for surface-water contamination Slope Water erosion Wind erosion
2G:	
Hamburg	Lime content Limited organic matter content Potential for surface-water contamination Slope Water erosion Wind erosion
3D:	
Castana	Lime content Potential for surface-water contamination Water erosion Wind erosion
3E:	
Castana	Lime content Potential for surface-water contamination Slope Water erosion Wind erosion
3F:	
Castana	Lime content Potential for surface-water contamination Slope Water erosion Wind erosion
10B:	
Monona	Potential for surface-water contamination Water erosion
10C:	
Monona	Potential for surface-water contamination Water erosion
10C2:	
Monona	Potential for surface-water contamination Previously eroded Water erosion

Table 6.--Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
10C3:	
Monona	Limited organic matter content Potential for surface-water contamination Previously eroded Water erosion
10D:	
Monona	Potential for surface-water contamination Water erosion
10D2:	
Monona	Potential for surface-water contamination Previously eroded Water erosion
10D3:	
Monona	Limited organic matter content Potential for surface-water contamination Previously eroded Water erosion
10E:	
Monona	Potential for surface-water contamination Slope Water erosion
10E2:	
Monona	Potential for surface-water contamination Previously eroded Slope Water erosion
10E3:	
Monona	Limited organic matter content Potential for surface-water contamination Previously eroded Slope Water erosion
10F:	
Monona	Potential for surface-water contamination Slope Water erosion
10F2:	
Monona	Potential for surface-water contamination Previously eroded Slope Water erosion
10F3:	
Monona	Limited organic matter content Potential for surface-water contamination Previously eroded Slope Water erosion
10G:	
Monona	Potential for surface-water contamination Slope Water erosion

Table 6.--Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
12B:	
Napier	Potential for surface-water contamination Water erosion
12C:	
Napier	Potential for surface-water contamination Water erosion
12D:	
Napier	Potential for surface-water contamination Water erosion
17B:	
Napier	Potential for surface-water contamination Water erosion
Kennebec	Flooding Potential for ground-water contamination Potential for surface-water contamination
Colo	Flooding Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water table
33D:	
Steinauer	Lime content Limited organic matter content Potential for surface-water contamination Potential poor tilth and compaction Surface crusting Water erosion Wind erosion
33E:	
Steinauer	Lime content Limited organic matter content Potential for surface-water contamination Potential poor tilth and compaction Slope Surface crusting Water erosion Wind erosion
33F:	
Steinauer	Lime content Limited organic matter content Potential for surface-water contamination Potential poor tilth and compaction Slope Surface crusting Water erosion Wind erosion

Table 6.--Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
33G:	
Steinauer	Lime content Limited organic matter content Potential for surface-water contamination Potential poor tilth and compaction Slope Surface crusting Water erosion Wind erosion
36:	
Salix	Potential poor tilth and compaction
44:	
Blencoe	Potential for ground-water contamination Potential poor tilth and compaction Water table
46:	
Keg	No major limitations or hazards
54:	
Zook	Flooding Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water table
54+:	
Zook	Flooding Potential for ground-water contamination Potential for surface-water contamination Water table
66:	
Luton	Potential for ground-water contamination Potential poor tilth and compaction Restricted permeability Water table
66+:	
Luton	Limited organic matter content Potential for ground-water contamination Restricted permeability Water table
67:	
Woodbury	Potential for ground-water contamination Potential poor tilth and compaction Water table
68:	
Napa	Potential for ground-water contamination Potential poor tilth and compaction Restricted permeability Salt content Water table

Table 6.--Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
70:	
McPaul	Lime content Limited organic matter content Wind erosion
123:	
Grantcenter	Potential for ground-water contamination Water table
133:	
Colo	Flooding Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water table
133+:	
Colo	Flooding Potential for ground-water contamination Potential for surface-water contamination Water table
137:	
Haynie	Lime content Wind erosion
144:	
Blake	Lime content Potential for ground-water contamination Water table Wind erosion
145:	
Onawa	Lime content Limited organic matter content Potential for ground-water contamination Potential poor tilth and compaction Wind erosion Water table
146:	Lime content
Onawa	Potential for ground-water contamination Potential poor tilth and compaction Water table
147:	
Modale	Lime content Potential for ground-water contamination Potential poor tilth and compaction Restricted permeability Water table Wind erosion
149:	
Modale	Lime content Potential for ground-water contamination Restricted permeability Water table Wind erosion

Table 6.--Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
155:	
Albaton	Lime content
	Potential for ground-water contamination
	Potential poor tilth and compaction
	Restricted permeability
	Water table
	Wind erosion
156:	
Albaton	Lime content
	Potential for ground-water contamination
	Potential poor tilth and compaction
	Restricted permeability
	Water table
157:	
Albaton	Lime content
	Limited organic matter content
	Potential for ground-water contamination
	Restricted permeability
	Wind erosion
	Potential poor tilth and compaction
	Water table
212:	
Kennebec	Flooding
	Potential for ground-water contamination
	Potential for surface-water contamination
212+:	
Kennebec	Flooding
	Potential for ground-water contamination
	Potential for surface-water contamination
220:	
Nodaway	Flooding
	Potential for ground-water contamination
	Potential for surface-water contamination
234:	
Nishna	Flooding
	Lime content
	Potential for ground-water contamination
	Potential for surface-water contamination
	Potential poor tilth and compaction
	Water table
237:	
Sarpy	Excessive permeability
	Limited available water capacity
	Limited organic matter content
	Potential for ground-water contamination
	Wind erosion
237B:	
Sarpy	Excessive permeability
	Limited available water capacity
	Limited organic matter content
	Potential for ground-water contamination
	Wind erosion

Table 6.--Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
244:	
Blend-------------------	Potential for ground-water contamination Potential poor tilth and compaction Restricted permeability
255:	
Cooper------------------	Potential for ground-water contamination Potential poor tilth and compaction Water table
257:	
Uturin------------------	Flooding Lime content Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water table
266:	
Smithland---------------	Flooding Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water table
275:	
Moville-----------------	Lime content Potential for ground-water contamination Restricted permeability Water table Wind erosion
366:	
Luton-------------------	Potential for ground-water contamination Potential poor tilth and compaction Restricted permeability Water table
430:	
Ackmore-----------------	Flooding Potential for ground-water contamination Potential for surface-water contamination Water table
436:	
Lakeport----------------	Potential for ground-water contamination Potential poor tilth and compaction Water table
446:	
Burcham-----------------	Potential for ground-water contamination Restricted permeability Water table
465:	
Tieville----------------	Lime content Potential for ground-water contamination Potential poor tilth and compaction Restricted permeability Water table Wind erosion

Table 6.--Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
510:	
Monona	No major limitations or hazards
510B:	
Monona	Potential for surface-water contamination Water erosion
510C:	
Monona	Potential for surface-water contamination Water erosion
510C2:	
Monona	Potential for surface-water contamination Previously eroded Water erosion
510C3:	
Monona	Limited organic matter content Potential for surface-water contamination Previously eroded Water erosion
514:	
Grable	Excessive permeability Lime content Potential for ground-water contamination Wind erosion
515:	
Percival	Excessive permeability Lime content Limited available water capacity Potential for ground-water contamination Potential poor tilth and compaction Water table
516:	
Vore	Excessive permeability Lime content Potential for ground-water contamination Potential poor tilth and compaction Wind erosion
552:	
Owego	Potential for ground-water contamination Potential poor tilth and compaction Restricted permeability Water table
553:	
Forney	Potential for ground-water contamination Potential poor tilth and compaction Restricted permeability Water table
670:	
Rawles	Flooding Lime content Potential for ground-water contamination Potential for surface-water contamination Wind erosion

Table 6.--Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
717D:	
Napier	Gullied Potential for surface-water contamination Water erosion
Gullied land.	
746:	
Lossing	Excessive permeability Potential for ground-water contamination Potential poor tilth and compaction Water table
747:	
Rodney	Potential for ground-water contamination Potential poor tilth and compaction Water table
748:	
Hornick	Potential for ground-water contamination Potential poor tilth and compaction Water table
754:	
Larpenteur	Potential for ground-water contamination Water table
945:	
Albaton	Flooding Lime content Ponding Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Restricted permeability
946:	
Albaton	Flooding Lime content Ponding Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Restricted permeability
1137:	
Haynie	Flooding Lime content Potential for surface-water contamination Wind erosion
1144:	
Blake	Flooding Lime content Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water table Wind erosion

Table 6.--Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
1145:	
Onawa	Flooding Lime content Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water table Wind erosion
1146:	
Onawa	Flooding Lime content Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water table
1147:	
Modale	Flooding Lime content Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Restricted permeability Water table Wind erosion
1150:	
Modale	Flooding Lime content Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Water table Wind erosion
1155:	
Albaton	Flooding Lime content Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Restricted permeability Water table Wind erosion
1156:	
Albaton	Flooding Lime content Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Restricted permeability Water table

Table 6.--Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
1157:	
Albaton	Flooding Lime content Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Water table Wind erosion
1220:	
Nodaway	Channeled Flooding Potential for ground-water contamination Potential for surface-water contamination
1237:	
Sarpy	Excessive permeability Flooding Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Wind erosion
1237B:	
Sarpy	Excessive permeability Flooding Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Wind erosion
1514:	
Grable	Excessive permeability Flooding Lime content Potential for ground-water contamination Potential for surface-water contamination Wind erosion
1515:	
Percival	Excessive permeability Flooding Lime content Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water table
1516:	
Vore	Excessive permeability Flooding Lime content Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Wind erosion

Table 6.--Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
1524:	
Morconick	Excessive permeability Flooding Lime content Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Wind erosion
1525:	
Scroll	Excessive permeability Flooding Lime content Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water table
1526:	
Scroll	Excessive permeability Flooding Lime content Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water table
1552:	
Owego	Flooding Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Restricted permeability Water table
1746:	
Lossing	Excessive permeability Flooding Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water table
1747:	
Rodney	Flooding Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water table
1750:	
Ticonic	Excessive permeability Flooding Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Wind erosion

Table 6.--Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
1849:	
Kenmoor	Excessive permeability Flooding Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water table Wind erosion
5010:	
Pits.	
5040:	
Orthents.	
5044:	
Fluvaquents.	
5045, 5046, 5047:	
Aquents.	
5051:	
Fluvaquents.	
5090:	
Aquents-Orthents.	

Table 7.--Agronomic Considerations

(See text for a description of the considerations listed in this table)

Map symbol and soil name	Subsoil phosphorus	Subsoil potassium	Tilth rating
1C------------------- Ida	Very low-------	Medium---------	Good.
1C3------------------ Ida	Very low-------	Medium---------	Good.
1D------------------- Ida	Very low-------	Medium---------	Good.
1D3------------------ Ida	Very low-------	Medium---------	Fair.
1E------------------- Ida	Very low-------	Medium---------	Fair.
1E3------------------ Ida	Very low-------	Medium---------	Fair.
1F------------------- Ida	Very low-------	Medium---------	Good.
1F3------------------ Ida	Very low-------	Medium---------	Fair.
1G------------------- Ida	Very low-------	Medium---------	Good.
2G------------------- Hamburg	Very low-------	Medium---------	Good.
3D------------------- Castana	Very low-------	Medium---------	Good.
3E------------------- Castana	Very low-------	Medium---------	Good.
3F------------------- Castana	Very low-------	Medium---------	Good.
10B------------------ Monona	Medium---------	Medium---------	Good.
10C------------------ Monona	Medium---------	Medium---------	Good.
10C2----------------- Monona	Medium---------	Medium---------	Good.
10C3----------------- Monona	Medium---------	Medium---------	Fair.
10D------------------ Monona	Medium---------	Medium---------	Good.
10D2----------------- Monona	Medium---------	Medium---------	Good.
10D3----------------- Monona	Medium---------	Medium---------	Fair.

Table 7.--Agronomic Considerations--Continued

Map symbol and soil name	Subsoil phosphorus	Subsoil potassium	Tilth rating
10E Monona	Medium	Medium	Good.
10E2 Monona	Medium	Medium	Good.
10E3 Monona	Medium	Medium	Fair.
10F Monona	Medium	Medium	Good.
10F2 Monona	Medium	Medium	Good.
10F3 Monona	Medium	Medium	Fair.
10G Monona	Medium	Medium	Good.
12B Napier	Very low	Medium	Good.
12C Napier	Very low	Medium	Good.
12D Napier	Very low	Medium	Good.
17B Napier-Kennebec-Colo	Very low	Medium	Good.
33D Steinauer	Very low	Medium	Fair.
33E Steinauer	Very low	Medium	Fair.
33F Steinauer	Very low	Medium	Fair.
33G Steinauer	Very low	Medium	Fair.
36 Salix	Very low	High	Good.
44 Blencoe	Very low	High	Poor.
46 Keg	Very low	High	Good.
54 Zook	High	Medium	Fair.
54+ Zook	High	Medium	Good.
66 Luton	Very low	High	Very poor.

Table 7.--Agronomic Considerations--Continued

Map symbol and soil name	Subsoil phosphorus	Subsoil potassium	Tilth rating
66+ Luton	Very low	High	Poor.
67 Woodbury	Very low	High	Poor.
68 Napa	Very low	High	Very poor.
70 McPaul	High	High	Good.
123 Grantcenter	Very low	High	Good.
133 Colo	High	Low	Fair.
133+ Colo	High	Low	Good.
137 Haynie	Very low	High	Fair.
144 Blake	Very low	High	Poor.
145 Onawa	Very low	High	Fair.
146 Onawa	Very low	High	Very poor.
147 Modale	Very low	High	Poor.
149 Modale	Very low	High	Good.
155 Albaton	Very low	High	Very poor.
156 Albaton	Very low	High	Very poor.
157 Albaton	Very low	High	Fair.
212 Kennebec	Very low	High	Good.
212+ Kennebec	Very low	High	Good.
220 Nodaway	High	Low	Fair.
234 Nishna	Very low	High	Fair.
237 Sarpy	Very low	High	Poor.

Table 7.--Agronomic Considerations--Continued

Map symbol and soil name	Subsoil phosphorus	Subsoil potassium	Tilth rating
237B----------------- Sarpy	Very low-------	High-----------	Fair.
244------------------ Blend	Very low-------	High-----------	Very poor.
255------------------ Cooper	Very low-------	High-----------	Fair.
257------------------ Uturin	Medium---------	High-----------	Fair.
266------------------ Smithland	Very low-------	High-----------	Fair.
275------------------ Moville	Medium---------	High-----------	Fair.
366------------------ Luton	Very low-------	High-----------	Fair.
430------------------ Ackmore	Very low-------	High-----------	Fair.
436------------------ Lakeport	Very low-------	High-----------	Fair.
446------------------ Burcham	Very low-------	High-----------	Good.
465------------------ Tieville	Very low-------	High-----------	Very poor.
510------------------ Monona	Medium---------	Medium---------	Good.
510B----------------- Monona	Medium---------	Medium---------	Good.
510C----------------- Monona	Medium---------	Medium---------	Good.
510C2---------------- Monona	Medium---------	Medium---------	Good.
510C3---------------- Monona	Medium---------	Medium---------	Fair.
514------------------ Grable	Very low-------	High-----------	Fair.
515------------------ Percival	Very low-------	High-----------	Very poor.
516------------------ Vore	Very low-------	High-----------	Fair.
552------------------ Owego	Very low-------	High-----------	Poor.
553------------------ Forney	Very low-------	High-----------	Very poor.

Table 7.--Agronomic Considerations--Continued

Map symbol and soil name	Subsoil phosphorus	Subsoil potassium	Tilth rating
670 Rawles	Medium	High	Fair.
717D Napier-Gullied land	Very low	Medium	Good.
746 Lossing	Very low	High	Very poor.
747 Rodney	Very low	High	Very poor.
748 Hornick	Very low	High	Poor.
754 Larpenteur	Very low	High	Good.
945 Albaton	Very low	High	Very poor.
946 Albaton	Very low	High	Very poor.
1137 Haynie	Very low	High	Fair.
1144 Blake	Very low	High	Poor.
1145 Onawa	Very low	High	Fair.
1146 Onawa	Very low	High	Very poor.
1147 Modale	Very low	High	Poor.
1150 Modale	Very low	High	Good.
1155 Albaton	Very low	High	Very poor.
1156 Albaton	Very low	High	Very poor.
1157 Albaton	Very low	High	Fair.
1220 Nodaway	High	Low	Fair.
1237 Sarpy	Very low	High	Poor.
1237B Sarpy	Very low	High	Poor.
1514 Grable	Very low	High	Fair.

Table 7.--Agronomic Considerations--Continued

Map symbol and soil name	Subsoil phosphorus	Subsoil potassium	Tilth rating
1515 Percival	Very low	High	Very poor.
1516 Vore	Very low	High	Fair.
1524 Morconick	Very low	High	Fair.
1525 Scroll	Very low	High	Very poor.
1526 Scroll	High	High	Poor.
1552 Owego	Very low	High	Poor.
1746 Lossing	Very low	High	Fair.
1747 Rodney	Very low	High	Very poor.
1750 Ticonic	Very low	High	Poor.
1849 Kenmoor	Very low	High	Poor.
5010. Pits			
5040. Orthents			
5044. Fluvaquents			
5045, 5046, 5047. Aquents			
5051. Fluvaquents			
5090. Aquents-Orthents			

Table 8.--Land Capability, Corn Suitability Rating, and Yields per Acre of Crops

(Yields are those that can be expected under a high level of management. They are for nonirrigated areas. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Map symbol and soil name	Land capability	Corn suitability rating	Corn	Oats	Soybeans
		PI*	Bu	Bu	Bu
1C--------------- Ida	3e	55	124	68	42
1C3-------------- Ida	3e	50	111	61	37
1D--------------- Ida	3e	45	115	63	39
1D3-------------- Ida	3e	40	102	56	34
1E--------------- Ida	4e	35	98	54	33
1E3-------------- Ida	4e	30	85	47	28
1F--------------- Ida	6e	15	---	---	---
1F3-------------- Ida	6e	10	---	---	---
1G--------------- Ida	7e	5	---	---	---
2G--------------- Hamburg	7e	5	---	---	---
3D--------------- Castana	3e	42	110	61	37
3E--------------- Castana	4e	32	93	51	31
3F--------------- Castana	6e	12	---	---	---
10B-------------- Monona	2e	80	142	78	48
10C-------------- Monona	3e	65	137	75	46
10C2------------- Monona	3e	63	133	73	45
10C3------------- Monona	3e	60	124	68	42
10D-------------- Monona	3e	55	128	70	43
10D2------------- Monona	3e	53	124	68	42

See footnote at end of table.

Table 8.--Land Capability, Corn Suitability Rating, and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Corn suitability rating	Corn	Oats	Soybeans
		PI*	Bu	Bu	Bu
10D3: Monona	3e	50	115	63	39
10E: Monona	4e	45	111	61	37
10E2: Monona	4e	43	107	59	36
10E3: Monona	4e	40	98	54	33
10F: Monona	6e	25	---	---	---
10F2: Monona	6e	20	---	---	---
10F3: Monona	7e	18	---	---	---
10G: Monona	6e	15	---	---	---
12B: Napier	2e	77	130	72	44
12C: Napier	3e	62	125	69	42
12D: Napier	3e	55	116	64	39
17B:		72	142	83	48
Napier	2e				
Kennebec	2w				
Colo	2w				
33D: Steinauer	4e	40	106	59	---
33E: Steinauer	6e	30	---	---	---
33F: Steinauer	6e	12	---	---	---
33G: Steinauer	7e	5	---	---	---
36: Salix	1	85	145	80	49
44: Blencoe	2w	70	120	66	40

See footnote at end of table.

Table 8.--Land Capability, Corn Suitability Rating, and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Corn suitability rating	Corn	Oats	Soybeans
		PI*	Bu	Bu	Bu
46---------------Keg	1	90	152	84	51
54---------------Zook	2w	70	126	70	39
54+--------------Zook	2w	75	131	72	44
66---------------Luton	3w	40	80	44	27
66+--------------Luton	3w	45	100	55	34
67---------------Woodbury	3w	55	100	55	34
68---------------Napa	4w	10	---	32	---
70---------------McPaul	1	78	133	73	45
123--------------Grantcenter	1	83	141	77	47
133--------------Colo	2w	80	136	82	46
133+-------------Colo	2w	85	140	84	47
137--------------Haynie	1	70	126	69	42
144--------------Blake	1	75	130	72	44
145--------------Onawa	2w	67	124	68	42
146--------------Onawa	2w	65	120	66	40
147--------------Modale	1	68	126	69	42
149--------------Modale	1	68	126	69	42
155--------------Albaton	3w	56	102	56	34
156--------------Albaton	3w	55	100	55	34

See footnote at end of table.

Table 8.--Land Capability, Corn Suitability Rating, and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Corn suitability rating	Corn	Oats	Soybeans
		PI*	Bu	Bu	Bu
157-------------- Albaton	3w	58	105	58	35
212-------------- Kennebec	2w	86	155	85	52
212+------------- Kennebec	2w	86	155	85	52
220-------------- Nodaway	2w	85	145	80	49
234-------------- Nishna	3w	65	120	66	40
237-------------- Sarpy	4s	10	---	25	---
237B------------- Sarpy	4s	5	---	23	---
244-------------- Blend	3w	51	100	55	34
255-------------- Cooper	2w	70	126	69	42
257-------------- Uturin	3w	68	123	68	41
266-------------- Smithland	2w	82	139	77	46
275-------------- Moville	2w	70	127	70	43
366-------------- Luton	3w	45	89	49	30
430-------------- Ackmore	2w	83	141	71	47
436-------------- Lakeport	1	80	138	76	46
446-------------- Burcham	1	85	145	80	49
465-------------- Tieville	3w	35	74	41	25
510-------------- Monona	1	85	145	80	49
510B------------- Monona	2e	80	142	78	48

See footnote at end of table.

Table 8.--Land Capability, Corn Suitability Rating, and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Corn suitability rating	Corn	Oats	Soybeans
		PI*	Bu	Bu	Bu
510C------------- Monona	3e	63	137	75	46
510C2------------ Monona	3e	63	133	73	45
510C3------------ Monona	3e	59	124	68	42
514-------------- Grable	2s	55	103	57	35
515-------------- Percival	2w	55	100	55	34
516-------------- Vore	2s	60	116	64	39
552-------------- Owego	3w	45	109	60	37
553-------------- Forney	3w	55	100	55	34
670-------------- Rawles	2w	75	138	76	46
717D-------------		5	---	---	---
Napier----------	3e				
Gullied land----	7e				
746-------------- Lossing	1	65	125	69	41
747-------------- Rodney	2w	58	114	63	38
748-------------- Hornick	1	73	130	72	43
754-------------- Larpenteur	1	80	136	75	45
945-------------- Albaton	4w	39	---	28	
946-------------- Albaton	5w	25	---	---	---
1137------------- Haynie	2w	66	126	69	42
1144------------- Blake	2w	71	126	69	42

See footnote at end of table.

Table 8.--Land Capability, Corn Suitability Rating, and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Corn suitability rating	Corn	Oats	Soybeans
		PI*	Bu	Bu	Bu
1145------------- Onawa	2w	66	120	66	40
1146------------- Onawa	2w	63	121	66	40
1147------------- Modale	1	64	120	66	40
1150------------- Modale	1	64	120	66	40
1155------------- Albaton	3w	52	102	56	34
1156------------- Albaton	3w	50	100	55	34
1157------------- Albaton	3w	54	105	58	35
1220------------- Nodaway	5w	25	---	---	---
1237------------- Sarpy	4s	8	---	25	---
1237B------------ Sarpy	4s	5	---	25	---
1514------------- Grable	2s	51	96	53	32
1515------------- Percival	2w	51	100	55	34
1516------------- Vore	2s	56	108	59	36
1524------------- Morconick	3s	18	---	29	---
1525------------- Scroll	2w	38	---	40	---
1526------------- Scroll	2w	40	---	40	---
1552------------- Owego	3w	53	109	60	36
1746------------- Lossing	2w	63	121	67	40
1747------------- Rodney	2w	56	110	61	37

See footnote at end of table.

Table 8.--Land Capability, Corn Suitability Rating, and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Corn suitability rating	Corn	Oats	Soybeans
		PI*	Bu	Bu	Bu
1750------------- Ticonic	3s	35	60	33	20
1849------------- Kenmoor	3s	43	80	44	27
5010. Pits					
5040. Orthents					
5044. Fluvaquents					
5045, 5046, 5047. Aquents					
5051. Fluvaquents					
5090. Aquents-Orthents					

* Productivity index: On a scale of 5 to 100.

Table 9.--Land Capability and Yields per Acre of Crops and Pasture

(Yields are those that can be expected under a high level of management. They are for nonirrigated areas. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Map symbol and soil name	Land capability	Bromegrass-alfalfa	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth bromegrass
		AUM*	Tons	AUM*	AUM*
1C--------------- Ida	3e	8.7	5.2	3.1	5.1
1C3-------------- Ida	3e	7.8	4.7	2.7	4.6
1D--------------- Ida	3e	8.1	4.8	2.8	4.7
1D3-------------- Ida	3e	7.2	4.3	2.5	4.2
1E--------------- Ida	4e	6.9	4.1	2.4	4.0
1E3-------------- Ida	4e	6.0	3.6	2.1	3.5
1F--------------- Ida	6e	6.2	3.7	2.2	3.6
1F3-------------- Ida	6e	5.4	3.2	1.9	3.2
1G--------------- Ida	7e	---	---	2.0	3.4
2G--------------- Hamburg	7e	---	---	---	---
3D--------------- Castana	3e	7.7	4.6	2.7	4.5
3E--------------- Castana	4e	6.5	3.9	2.3	3.8
3F--------------- Castana	6e	5.5	3.0	1.9	3.2
10B-------------- Monona	2e	10.0	6.0	3.5	5.8
10C-------------- Monona	3e	9.6	5.8	3.4	5.6
10C2------------- Monona	3e	9.3	5.6	3.3	5.5
10C3------------- Monona	3e	8.7	5.2	3.1	5.1
10D-------------- Monona	3e	9.0	5.4	3.2	5.3

See footnote at end of table.

Table 9.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Bromegrass-alfalfa	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth bromegrass
		AUM*	Tons	AUM*	AUM*
10D2------------- Monona	3e	8.7	5.2	3.1	5.1
10D3------------- Monona	3e	8.1	4.8	2.8	4.7
10E-------------- Monona	4e	7.8	4.7	2.7	4.6
10E2------------- Monona	4e	7.5	4.5	2.6	4.4
10E3------------- Monona	4e	6.9	4.1	2.4	4.0
10F-------------- Monona	6e	7.1	4.2	2.5	4.1
10F2------------- Monona	6e	6.8	4.1	2.4	4.0
10F3------------- Monona	7e	---	---	2.2	---
10G-------------- Monona	6e	7.1	4.2	2.5	4.1
12B-------------- Napier	2e	9.1	5.5	3.2	5.3
12C-------------- Napier	3e	8.8	5.3	3.1	5.1
12D-------------- Napier	3e	8.1	4.9	2.9	4.8
17B--------------		9.1	5.5	3.2	5.3
Napier----------	2e				
Kennebec--------	2w				
Colo------------	2w				
33D-------------- Steinauer	4e	7.6	4.5	2.6	2.0
33E-------------- Steinauer	6e	---	---	2.1	---
33F-------------- Steinauer	6e	---	---	1.9	---
33G-------------- Steinauer	7e	---	---	1.8	---
36--------------- Salix	1	10.1	6.1	3.6	5.9

See footnote at end of table.

Table 9.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Bromegrass-alfalfa	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth bromegrass
		AUM*	Tons	AUM*	AUM*
44--------------- Blencoe	2w	6.0	3.6	3.0	4.9
46--------------- Keg	1	10.7	6.4	3.7	6.2
54--------------- Zook	2w	---	3.8	3.1	5.2
54+-------------- Zook	2w	---	3.8	3.1	5.2
66--------------- Luton	3w	4.0	2.4	2.0	3.3
66+-------------- Luton	3w	5.0	3.0	2.5	4.1
67--------------- Woodbury	3w	5.0	3.0	2.5	4.1
68--------------- Napa	4w	2.0	1.7	1.2	2.3
70--------------- McPaul	1	9.3	5.6	3.3	5.5
123-------------- Grantcenter	1	7.4	6.3	3.8	6.9
133-------------- Colo	2w	6.8	4.1	3.3	5.6
133+------------- Colo	2w	7.0	4.2	3.4	5.7
137-------------- Haynie	1	8.8	5.3	3.1	5.2
144-------------- Blake	1	8.7	5.2	3.2	5.3
145-------------- Onawa	2w	6.2	3.7	3.1	5.1
146-------------- Onawa	2w	6.0	3.6	3.0	4.9
147-------------- Modale	1	8.4	5.0	3.1	5.2
149-------------- Modale	1	8.4	5.0	3.1	5.2
155-------------- Albaton	3w	5.1	3.1	2.5	4.2

See footnote at end of table.

Table 9.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Bromegrass-alfalfa	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth bromegrass
		AUM*	Tons	AUM*	AUM*
156-------------- Albaton	3w	5.0	3.0	2.5	4.1
157-------------- Albaton	3w	5.3	3.2	2.6	4.3
212-------------- Kennebec	2w	11.4	6.8	4.0	6.6
212+------------- Kennebec	2w	11.4	6.5	3.8	6.4
220-------------- Nodaway	2w	10.1	6.1	4.0	5.9
234-------------- Nishna	3w	6.0	3.6	3.0	4.9
237-------------- Sarpy	4s	---	1.5	---	3.0
237B------------- Sarpy	4s	---	1.5	---	3.0
244-------------- Blend	3w	5.0	3.0	2.5	4.1
255-------------- Cooper	2w	8.4	5.0	3.1	5.2
257-------------- Uturin	3w	5.1	3.1	2.6	4.2
266-------------- Smithland	2w	7.1	4.3	3.6	5.9
275-------------- Moville	2w	8.5	5.1	3.1	5.2
366-------------- Luton	3w	4.5	2.7	2.2	3.7
430-------------- Ackmore	2w	7.1	4.2	3.5	5.8
436-------------- Lakeport	1	9.2	5.5	3.4	5.7
446-------------- Burcham	1	9.7	5.8	3.6	6.0
465-------------- Tieville	3w	4.0	2.4	2.0	3.3
510-------------- Monona	1	10.2	6.1	3.6	6.0
510B------------- Monona	2e	10.0	6.0	3.5	5.8

See footnote at end of table.

Table 9.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Bromegrass-alfalfa	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth bromegrass
		AUM*	Tons	AUM*	AUM*
510C------------- Monona	3e	9.6	5.8	3.4	5.6
510C2------------ Monona	3e	9.3	5.6	3.3	5.5
510C3------------ Monona	3e	8.7	5.2	3.1	5.1
514-------------- Grable	2s	7.2	4.3	2.5	4.2
515-------------- Percival	2w	6.7	4.0	2.5	4.1
516-------------- Vore	2s	8.1	4.9	2.9	4.8
552-------------- Owego	3w	5.5	3.3	2.7	4.5
553-------------- Forney	3w	5.0	3.0	2.5	4.1
670-------------- Rawles	2w	7.7	4.6	2.7	4.5
717D-------------		---	---	---	---
Napier----------	3e				
Gullied land----	7e				
746-------------- Lossing	1	5.9	3.8	4.0	5.5
747-------------- Rodney	2w	5.7	3.4	2.9	5.0
748-------------- Hornick	1	8.7	5.2	3.2	5.4
754-------------- Larpenteur	1	7.1	5.4	3.9	6.5
945-------------- Albaton	4w	2.5	1.5	1.2	2.0
946-------------- Albaton	5w	---	---	2.0	---
1137------------- Haynie	2w	8.8	5.3	3.1	5.2
1144------------- Blake	2w	9.4	4.7	3.5	5.0
1145------------- Onawa	2w	5.8	3.5	2.9	4.6

See footnote at end of table.

Table 9.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Bromegrass-alfalfa	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth bromegrass
		AUM*	Tons	AUM*	AUM*
1146------------ Onawa	2w	5.8	3.5	2.9	4.6
1147------------ Modale	1	8.4	5.0	3.1	5.2
1150------------ Modale	1	8.4	5.0	3.1	5.2
1155------------ Albaton	3w	5.1	3.1	2.5	4.2
1156------------ Albaton	3w	5.0	3.0	2.5	4.1
1157------------ Albaton	3w	5.3	3.2	2.6	4.3
1220------------ Nodaway	5w	7.0	4.2	2.5	6.2
1237------------ Sarpy	4s	---	0.9	---	1.8
1237B----------- Sarpy	4s	---	0.9	---	1.8
1514------------ Grable	2s	7.2	4.3	2.5	4.2
1515------------ Percival	2w	6.7	4.0	2.5	4.1
1516------------ Vore	2s	8.1	4.9	2.9	4.8
1524------------ Morconick	3s	3.6	2.2	1.3	2.1
1525------------ Scroll	2w	4.3	2.6	1.6	2.7
1526------------ Scroll	2w	4.7	2.8	1.8	2.9
1552------------ Owego	3w	5.5	3.3	2.7	4.5
1746------------ Lossing	2w	5.9	3.8	4.0	5.5
1747------------ Rodney	2w	5.7	3.4	2.9	5.0
1750------------ Ticonic	3s	3.9	2.6	1.2	3.2

See footnote at end of table.

Table 9.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Bromegrass-alfalfa	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth bromegrass
		AUM*	Tons	AUM*	AUM*
1849------------- Kenmoor	3s	---	3.0	---	6.0
5010. Pits					
5040. Orthents					
5044. Fluvaquents					
5045, 5046, 5047. Aquents					
5051. Fluvaquents					
5090. Aquents-Orthents					

* Animal unit month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

Table 10.--Land Capability and Yields per Acre of Irrigated Crops

(Yields are those that can be expected under a high level of management. They are for irrigated areas. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Map symbol and soil name	Land capability	Corn	Soybeans
		Bu	Bu
12B------------- Napier	3e	145	---
12C------------- Napier	4e	140	---
17B:			
Napier----------	3e	145	---
Kennebec.			
Colo.			
36-------------- Salix	1	150	50
137------------- Haynie	1	162	---
145------------- Onawa	2w	150	---
146------------- Onawa	2w	147	---
147------------- Modale	1	140	---
149------------- Modale	1	140	---
156------------- Albaton	3w	137	---
275------------- Moville	2w	150	55
465------------- Tieville	3w	62	30
515------------- Percival	2w	120	40
552------------- Owego	3w	125	45
553------------- Forney	3w	110	39
746------------- Lossing	1	152	50

Table 10.--Land Capability and Yields per Acre of Irrigated Crops--Continued

Map symbol and soil name	Land capability	Corn	Soybeans
		Bu	Bu
747------------- Rodney	2w	138	46
945------------- Albaton	4w	60	22
1137------------ Haynie	2w	162	---
1145------------ Onawa	2w	138	46
1146------------ Onawa	2w	138	46
1147------------ Modale	1	140	---
1150------------ Modale	1	140	---
1156------------ Albaton	3w	137	---
1237------------ Sarpy	3s	60	---
1237B----------- Sarpy	3s	60	---
1515------------ Percival	2w	120	40
1525------------ Scroll	2w	120	40
1526------------ Scroll	2w	120	40
1552------------ Owego	3w	125	45
1746------------ Lossing	2w	152	50
1747------------ Rodney	2w	138	46

Table 11.--Prime Farmland

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
10B	Monona silt loam, 2 to 5 percent slopes
12B	Napier silt loam, 2 to 5 percent slopes
17B	Napier-Kennebec-Colo complex, 0 to 5 percent slopes (where drained)
36	Salix silty clay loam, 0 to 2 percent slopes, rarely flooded
44	Blencoe silty clay, 0 to 2 percent slopes, rarely flooded
46	Keg silt loam, 0 to 2 percent slopes, rarely flooded
54	Zook silty clay loam, 0 to 2 percent slopes, occasionally flooded (where drained)
54+	Zook silt loam, 0 to 2 percent slopes, occasionally flooded, overwash (where drained)
70	McPaul silt loam, 0 to 2 percent slopes, rarely flooded
123	Grantcenter silty clay loam, 0 to 2 percent slopes, rarely flooded
133	Colo silty clay loam, 0 to 2 percent slopes, occasionally flooded (where drained)
133+	Colo silt loam, 0 to 2 percent slopes, occasionally flooded, overwash (where drained)
137	Haynie silt loam, 0 to 2 percent slopes, rarely flooded
144	Blake silty clay loam, 0 to 2 percent slopes, rarely flooded
145	Onawa silt loam, 0 to 2 percent slopes, rarely flooded
146	Onawa silty clay, 0 to 2 percent slopes, rarely flooded
147	Modale silty clay loam, 0 to 2 percent slopes, rarely flooded
149	Modale silt loam, 0 to 2 percent slopes, rarely flooded
212	Kennebec silt loam, 0 to 2 percent slopes, occasionally flooded
212+	Kennebec silt loam, 0 to 2 percent slopes, occasionally flooded, overwash
220	Nodaway silt loam, 0 to 2 percent slopes, occasionally flooded
234	Nishna silty clay loam, 0 to 2 percent slopes, occasionally flooded (where drained)
244	Blend silty clay, 0 to 2 percent slopes, rarely flooded (where drained)
255	Cooper silty clay loam, 0 to 2 percent slopes, rarely flooded
257	Uturin silt loam, 0 to 2 percent slopes, occasionally flooded (where drained)
266	Smithland silty clay loam, 0 to 2 percent slopes, occasionally flooded
275	Moville silt loam, 0 to 2 percent slopes, rarely flooded (where drained)
430	Ackmore silt loam, 0 to 2 percent slopes, occasionally flooded
436	Lakeport silty clay loam, 0 to 2 percent slopes, rarely flooded
446	Burcham silt loam, 0 to 2 percent slopes, rarely flooded
510	Monona silt loam, bench, 0 to 2 percent slopes
510B	Monona silt loam, bench, 2 to 5 percent slopes
514	Grable silt loam, 0 to 2 percent slopes, rarely flooded
515	Percival silty clay, 0 to 2 percent slopes, rarely flooded
516	Vore silty clay loam, 0 to 2 percent slopes, rarely flooded
670	Rawles silt loam, 0 to 2 percent slopes, occasionally flooded
746	Lossing silty clay, 0 to 2 percent slopes, rarely flooded
747	Rodney silty clay, 0 to 2 percent slopes, rarely flooded (where drained)
748	Hornick silty clay, 0 to 2 percent slopes, rarely flooded
754	Larpenteur silt loam, 0 to 2 percent slopes, rarely flooded
1137	Haynie silt loam, 0 to 2 percent slopes, occasionally flooded
1144	Blake silty clay loam, 0 to 2 percent slopes, occasionally flooded
1145	Onawa silt loam, 0 to 2 percent slopes, occasionally flooded
1146	Onawa silty clay, 0 to 2 percent slopes, occasionally flooded
1147	Modale silty clay loam, 0 to 2 percent slopes, occasionally flooded
1150	Modale silt loam, 0 to 2 percent slopes, occasionally flooded
1514	Grable silt loam, 0 to 2 percent slopes, occasionally flooded
1515	Percival silty clay, 0 to 2 percent slopes, occasionally flooded
1516	Vore silty clay loam, 0 to 2 percent slopes, occasionally flooded
1746	Lossing silty clay, 0 to 2 percent slopes, occasionally flooded
1747	Rodney silty clay, 0 to 2 percent slopes, occasionally flooded (where drained)

Table 12.--Windbreaks and Environmental Plantings

(Only the soils suitable for windbreaks and environmental plantings are listed. Absence of an entry indicates that trees generally do not grow to the given height)

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
1C:					
Ida-------------	American plum, silver buffaloberry.	Siberian peashrub, hackberry, Russian-olive, Rocky Mountain juniper, eastern redcedar.	Green ash, honeylocust, ponderosa pine, Siberian elm.	---	---
1C3:					
Ida-------------	American plum, silver buffaloberry.	Siberian peashrub, hackberry, Russian-olive, Rocky Mountain juniper, eastern redcedar.	Green ash, honeylocust, ponderosa pine, Siberian elm.	---	---
1D:					
Ida-------------	American plum, silver buffaloberry.	Siberian peashrub, hackberry, Russian-olive, Rocky Mountain juniper, eastern redcedar.	Green ash, honeylocust, ponderosa pine, Siberian elm.	---	---
1D3:					
Ida-------------	American plum, silver buffaloberry.	Siberian peashrub, hackberry, Russian-olive, Rocky Mountain juniper, eastern redcedar.	Green ash, honeylocust, ponderosa pine, Siberian elm.	---	---
1E:					
Ida-------------	American plum, silver buffaloberry.	Siberian peashrub, hackberry, Russian-olive, Rocky Mountain juniper, eastern redcedar.	Green ash, honeylocust, ponderosa pine, Siberian elm.	---	---
1E3:					
Ida-------------	American plum, silver buffaloberry.	Siberian peashrub, hackberry, Russian-olive, Rocky Mountain juniper, eastern redcedar.	Green ash, honeylocust, ponderosa pine, Siberian elm.	---	---
1F:					
Ida-------------	American plum, silver buffaloberry.	Siberian peashrub, hackberry, Russian-olive, Rocky Mountain juniper, eastern redcedar.	Green ash, honeylocust, ponderosa pine, Siberian elm.	---	---

Table 12.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
1F3:					
Ida	American plum, silver buffaloberry.	Siberian peashrub, hackberry, Russian-olive, Rocky Mountain juniper, eastern redcedar.	Green ash, honeylocust, ponderosa pine, Siberian elm.	---	---
1G:					
Ida	American plum, silver buffaloberry.	Siberian peashrub, hackberry, Russian-olive, Rocky Mountain juniper, eastern redcedar.	Green ash, honeylocust, ponderosa pine, Siberian elm.	---	---
2G:					
Hamburg	Siberian peashrub	Washington hawthorn, Russian-olive, eastern redcedar, Osage-orange.	Northern catalpa, green ash, honeylocust, bur oak, black locust.	Siberian elm	---
3D:					
Castana	American plum, silver buffaloberry.	Siberian peashrub, hackberry, cotoneaster, Russian-olive, Rocky Mountain juniper, eastern redcedar.	Green ash, honeylocust, ponderosa pine, Siberian elm.	---	---
3E:					
Castana	American plum, silver buffaloberry.	Siberian peashrub, hackberry, cotoneaster, Russian-olive, Rocky Mountain juniper, eastern redcedar.	Green ash, honeylocust, ponderosa pine, Siberian elm.	---	---
3F:					
Castana	American plum, silver buffaloberry.	Siberian peashrub, hackberry, cotoneaster, Russian-olive, Rocky Mountain juniper, eastern redcedar.	Green ash, honeylocust, ponderosa pine, Siberian elm.	---	---
10B:					
Monona	---	Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, eastern redcedar, blue spruce, bur oak.	Green ash, honeylocust, ponderosa pine.	---
10C:					
Monona	---	Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, eastern redcedar, blue spruce, bur oak.	Green ash, honeylocust, ponderosa pine.	---

Table 12.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
10C2:					
Monona	---	Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, eastern redcedar, blue spruce, bur oak.	Green ash, honeylocust, ponderosa pine.	---
10C3:					
Monona	---	Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, eastern redcedar, blue spruce, bur oak.	Green ash, honeylocust, ponderosa pine.	---
10D:					
Monona	---	Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, eastern redcedar, blue spruce, bur oak.	Green ash, honeylocust, ponderosa pine.	---
10D2:					
Monona	---	Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, eastern redcedar, blue spruce, bur oak.	Green ash, honeylocust, ponderosa pine.	---
10D3:					
Monona	---	Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, eastern redcedar, blue spruce, bur oak.	Green ash, honeylocust, ponderosa pine.	---
10E:					
Monona	---	Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, eastern redcedar, blue spruce, bur oak.	Green ash, honeylocust, ponderosa pine.	---
10E2:					
Monona	---	Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, eastern redcedar, blue spruce, bur oak.	Green ash, honeylocust, ponderosa pine.	---
10E3:					
Monona	---	Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, eastern redcedar, blue spruce, bur oak.	Green ash, honeylocust, ponderosa pine.	---
10F:					
Monona	---	Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, eastern redcedar, blue spruce, bur oak.	Green ash, honeylocust, ponderosa pine.	---

Table 12.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
10F2:					
Monona----------	---	Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, eastern redcedar, blue spruce, bur oak.	Green ash, honeylocust, ponderosa pine.	---
10F3:					
Monona----------	---	Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, eastern redcedar, blue spruce, bur oak.	Green ash, honeylocust, ponderosa pine.	---
10G:					
Monona----------	---	Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, eastern redcedar, blue spruce, bur oak.	Green ash, honeylocust, ponderosa pine.	---
12B:					
Napier----------	---	Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, eastern redcedar, blue spruce, bur oak.	Green ash, honeylocust, ponderosa pine.	---
12C:					
Napier----------	---	Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, eastern redcedar, blue spruce, bur oak.	Green ash, honeylocust, ponderosa pine.	---
12D:					
Napier----------	---	Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, eastern redcedar, blue spruce, bur oak.	Green ash, honeylocust, ponderosa pine.	---
17B:					
Napier----------	---	Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, eastern redcedar, blue spruce, bur oak.	Green ash, honeylocust, ponderosa pine.	---
Kennebec--------	Peking cotoneaster	Siberian peashrub, American plum, lilac.	Eastern redcedar, Manchurian crabapple, ponderosa pine.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.
Colo------------	---	Redosier dogwood, American plum.	White fir, Amur maple, hackberry, white spruce, tall purple willow.	Green ash, golden willow.	Silver maple, eastern cottonwood.

Table 12.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
33D:					
Steinauer-------	American plum, silver buffaloberry.	Siberian peashrub, hackberry, Russian-olive, Rocky Mountain juniper, eastern redcedar.	Green ash, honeylocust, ponderosa pine, Siberian elm.	---	---
36:					
Salix-----------	---	Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, eastern redcedar, blue spruce, bur oak.	Green ash, honeylocust, ponderosa pine.	---
44:					
Blencoe---------	---	Amur maple, autumn olive, Amur honeysuckle, lilac.	Eastern redcedar	Hackberry, green ash, honeylocust, Austrian pine, eastern white pine, pin oak.	Eastern cottonwood.
46:					
Keg-------------	Peking cotoneaster	Siberian peashrub, American plum, lilac.	Eastern redcedar, Manchurian crabapple, ponderosa pine.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.
54:					
Zook------------	Redosier dogwood	American plum, common chokecherry.	Hackberry, eastern redcedar.	Silver maple, green ash, honeylocust, Austrian pine, northern red oak, golden willow.	Eastern cottonwood.
54+:					
Zook------------	Redosier dogwood	American plum, common chokecherry.	Hackberry, eastern redcedar.	Silver maple, green ash, honeylocust, Austrian pine, northern red oak, golden willow.	Eastern cottonwood.
66:					
Luton-----------	Lilac-------------	Siberian peashrub	Hackberry, eastern redcedar, ponderosa pine, blue spruce.	Silver maple, green ash, honeylocust, golden willow.	Eastern cottonwood.
66+:					
Luton-----------	Lilac-------------	Siberian peashrub	Hackberry, eastern redcedar, ponderosa pine, blue spruce.	Silver maple, green ash, honeylocust, golden willow.	Eastern cottonwood.
67:					
Woodbury--------	Lilac-------------	Siberian peashrub	Hackberry, eastern redcedar, ponderosa pine, blue spruce.	Silver maple, green ash, honeylocust, golden willow.	Eastern cottonwood.

Table 12.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
70:					
McPaul	---	Siberian peashrub, lilac.	Russian-olive, eastern redcedar, ponderosa pine, bur oak.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.
123:					
Grantcenter	---	Siberian peashrub, lilac.	Russian-olive, eastern redcedar.	Hackberry, green ash, honeylocust, ponderosa pine, eastern white pine, bur oak, golden willow.	Eastern cottonwood.
133:					
Colo	---	Redosier dogwood, American plum.	White fir, Amur maple, hackberry, white spruce, tall purple willow.	Green ash, golden willow.	Silver maple, eastern cottonwood.
133+:					
Colo	---	Redosier dogwood, American plum.	White fir, Amur maple, hackberry, white spruce, tall purple willow.	Green ash, golden willow.	Silver maple, eastern cottonwood.
137:					
Haynie	---	Siberian peashrub, lilac.	Russian-olive, eastern redcedar, ponderosa pine, bur oak.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.
144:					
Blake	Blackhaw	Siberian peashrub	Washington hawthorn, Russian-olive, eastern redcedar, Osage-orange.	Hackberry, green ash, honeylocust, bur oak.	Eastern cottonwood.
145:					
Onawa	---	Siberian peashrub, lilac.	Russian-olive, eastern redcedar, ponderosa pine, bur oak.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.
146:					
Onawa	---	Siberian peashrub, lilac.	Russian-olive, eastern redcedar, ponderosa pine, bur oak.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.
147:					
Modale	---	Siberian peashrub, lilac.	Russian-olive, eastern redcedar, ponderosa pine, bur oak.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.

Table 12.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
149:					
Modale	---	Siberian peashrub, lilac.	Russian-olive, eastern redcedar, ponderosa pine, bur oak.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.
155:					
Albaton	Lilac	Siberian peashrub	Hackberry, Russian-olive, eastern redcedar, ponderosa pine, blue spruce.	Green ash, honeylocust, golden willow.	Eastern cottonwood.
156:					
Albaton	Lilac	Siberian peashrub	Hackberry, Russian-olive, eastern redcedar, ponderosa pine, blue spruce.	Green ash, honeylocust, golden willow.	Eastern cottonwood.
157:					
Albaton	Lilac	Siberian peashrub	Hackberry, Russian-olive, eastern redcedar, ponderosa pine, blue spruce.	Green ash, honeylocust, golden willow.	Eastern cottonwood.
212:					
Kennebec	Peking cotoneaster	Siberian peashrub, American plum, lilac.	Eastern redcedar, Manchurian crabapple, ponderosa pine.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.
212+:					
Kennebec	Peking cotoneaster	Siberian peashrub, American plum, lilac.	Eastern redcedar, Manchurian crabapple, ponderosa pine.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.
220:					
Nodaway	---	Amur maple, autumn olive, Amur honeysuckle, lilac.	Eastern redcedar	Hackberry, green ash, honeylocust, Austrian pine, eastern white pine, pin oak.	Eastern cottonwood.
234:					
Nishna	Lilac	Siberian peashrub	Hackberry, Russian-olive, eastern redcedar, ponderosa pine, blue spruce.	Green ash, honeylocust, golden willow.	Eastern cottonwood.
237:					
Sarpy	Blackhaw	Siberian peashrub, Washington hawthorn.	Russian-olive, eastern redcedar, Osage-orange.	Hackberry, green ash, honeylocust, bur oak.	Eastern cottonwood.
237B:					
Sarpy	Blackhaw	Siberian peashrub, Washington hawthorn.	Russian-olive, eastern redcedar, Osage-orange.	Hackberry, green ash, honeylocust, bur oak.	Eastern cottonwood.

Table 12.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
244: Blend	Lilac	Siberian peashrub	Hackberry, eastern redcedar, ponderosa pine, blue spruce.	Silver maple, green ash, honeylocust, golden willow.	Eastern cottonwood.
255: Cooper	---	Amur maple, autumn olive, Amur honeysuckle, lilac.	Eastern redcedar	Hackberry, green ash, honeylocust, Austrian pine, eastern white pine, pin oak.	Eastern cottonwood.
257: Uturin	Lilac	Siberian peashrub	Hackberry, Russian-olive, eastern redcedar, ponderosa pine, blue spruce.	Green ash, honeylocust, golden willow.	Eastern cottonwood.
266: Smithland	---	Redosier dogwood, American plum.	White fir, Amur maple, hackberry, white spruce, tall purple willow.	Green ash, golden willow.	Silver maple, eastern cottonwood.
275: Moville	---	Siberian peashrub, lilac.	Russian-olive, eastern redcedar, ponderosa pine, bur oak.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.
366: Luton	Lilac	Siberian peashrub	Hackberry, eastern redcedar, ponderosa pine, blue spruce.	Silver maple, green ash, honeylocust, golden willow.	Eastern cottonwood.
430: Ackmore	---	Redosier dogwood, lilac.	Amur maple, white spruce, blue spruce, northern whitecedar.	Hackberry, green ash, Austrian pine, eastern white pine.	Silver maple.
436: Lakeport	Peking cotoneaster	Siberian peashrub, American plum, lilac.	Eastern redcedar, Manchurian crabapple, ponderosa pine.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.
446: Burcham	---	Siberian peashrub, lilac.	Russian-olive, eastern redcedar, ponderosa pine, bur oak.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.

Table 12.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
465:					
Tieville--------	Redosier dogwood	American plum, common chokecherry.	Hackberry, eastern redcedar.	Silver maple, green ash, honeylocust, Austrian pine, northern red oak, golden willow.	Eastern cottonwood.
510:					
Monona----------	---	Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, eastern redcedar, blue spruce, bur oak.	Green ash, honeylocust, ponderosa pine.	---
510B:					
Monona----------	---	Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, eastern redcedar, blue spruce, bur oak.	Green ash, honeylocust, ponderosa pine.	---
510C:					
Monona----------	---	Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, eastern redcedar, blue spruce, bur oak.	Green ash, honeylocust, ponderosa pine.	---
510C2:					
Monona----------	---	Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, eastern redcedar, blue spruce, bur oak.	Green ash, honeylocust, ponderosa pine.	---
510C3:					
Monona----------	---	Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, eastern redcedar, blue spruce, bur oak.	Green ash, honeylocust, ponderosa pine.	---
514:					
Grable----------	---	Siberian peashrub, lilac.	Russian-olive, eastern redcedar, ponderosa pine, bur oak.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.
515:					
Percival--------	---	Siberian peashrub, lilac.	Russian-olive, eastern redcedar, ponderosa pine, bur oak.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.
516:					
Vore------------	Blackhaw----------	Siberian peashrub	Washington hawthorn, Russian-olive, eastern redcedar, Osage-orange.	Hackberry, green ash, honeylocust, bur oak.	Eastern cottonwood.

Table 12.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
552: Owego	---	Siberian peashrub, lilac.	Russian-olive, eastern redcedar, ponderosa pine, bur oak.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.
553: Forney	Redosier dogwood	American plum, common chokecherry.	Hackberry, eastern redcedar.	Silver maple, green ash, honeylocust, Austrian pine, northern red oak, golden willow.	Eastern cottonwood.
670: Rawles	Blackhaw	Siberian peashrub	Washington hawthorn, Russian-olive, eastern redcedar, Osage-orange.	Hackberry, green ash, honeylocust, bur oak.	Eastern cottonwood.
717D: Napier	---	Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, eastern redcedar, blue spruce, bur oak.	Green ash, honeylocust, ponderosa pine.	---
Gullied land.					
746: Lossing	---	Siberian peashrub, lilac.	Eastern redcedar, ponderosa pine, eastern white pine, bur oak.	Hackberry, Russian-olive, green ash, honeylocust, golden willow.	Eastern cottonwood.
747: Rodney	---	Siberian peashrub, American plum.	Russian-olive, eastern redcedar, ponderosa pine, bur oak.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.
748: Hornick	American plum	Siberian peashrub	Russian-olive, eastern redcedar, ponderosa pine, bur oak.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.
754: Larpenteur	Peking cotoneaster	Siberian peashrub, American plum, lilac.	Eastern redcedar, Manchurian crabapple, ponderosa pine.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.
1137: Haynie	---	Siberian peashrub, lilac.	Russian-olive, eastern redcedar, ponderosa pine, bur oak.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.

Table 12.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
1144:					
Blake	Blackhaw	Siberian peashrub	Washington hawthorn, Russian-olive, eastern redcedar, Osage-orange.	Hackberry, green ash, honeylocust, bur oak.	Eastern cottonwood.
1145:					
Onawa	---	Siberian peashrub, lilac.	Russian-olive, eastern redcedar, ponderosa pine, bur oak.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.
1146:					
Onawa	---	Siberian peashrub, lilac.	Russian-olive, eastern redcedar, ponderosa pine, bur oak.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.
1147:					
Modale	---	Siberian peashrub, lilac.	Russian-olive, eastern redcedar, ponderosa pine, bur oak.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.
1150:					
Modale	---	Siberian peashrub, lilac.	Russian-olive, eastern redcedar, ponderosa pine, bur oak.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.
1155:					
Albaton	Lilac	Siberian peashrub	Hackberry, Russian-olive, eastern redcedar, ponderosa pine, blue spruce.	Green ash, honeylocust, golden willow.	Eastern cottonwood.
1156:					
Albaton	Lilac	Siberian peashrub	Hackberry, Russian-olive, eastern redcedar, ponderosa pine, blue spruce.	Green ash, honeylocust, golden willow.	Eastern cottonwood.
1157:					
Albaton	Lilac	Siberian peashrub	Hackberry, Russian-olive, eastern redcedar, ponderosa pine, blue spruce.	Green ash, honeylocust, golden willow.	Eastern cottonwood.
1220:					
Nodaway	---	Amur maple, autumn olive, Amur honeysuckle, lilac.	Eastern redcedar	Hackberry, green ash, honeylocust, Austrian pine, eastern white pine, pin oak.	Eastern cottonwood.

Table 12.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
1237: Sarpy	Blackhaw	Siberian peashrub	Washington hawthorn, Russian-olive, eastern redcedar, Osage-orange.	Hackberry, green ash, honeylocust, bur oak.	Eastern cottonwood.
1237B: Sarpy	Blackhaw	Siberian peashrub	Washington hawthorn, Russian-olive, eastern redcedar, Osage-orange.	Hackberry, green ash, honeylocust, bur oak.	Eastern cottonwood.
1514: Grable	---	Siberian peashrub, lilac.	Russian-olive, eastern redcedar, ponderosa pine, bur oak.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.
1515: Percival	---	Siberian peashrub, lilac.	Russian-olive, eastern redcedar, ponderosa pine, bur oak.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.
1516: Vore	Blackhaw	Siberian peashrub	Washington hawthorn, Russian-olive, eastern redcedar, Osage-orange.	Hackberry, green ash, honeylocust, bur oak.	Eastern cottonwood.
1524: Morconick	---	Siberian peashrub, lilac.	Russian-olive, eastern redcedar, ponderosa pine, bur oak.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.
1525: Scroll	---	Siberian peashrub, lilac.	Russian-olive, eastern redcedar, ponderosa pine, bur oak.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.
1526: Scroll	---	Siberian peashrub, lilac.	Russian-olive, eastern redcedar, ponderosa pine, bur oak.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.
1552: Owego	---	Siberian peashrub, lilac.	Russian-olive, eastern redcedar, ponderosa pine, bur oak.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.
1746: Lossing	---	Siberian peashrub, lilac.	Eastern redcedar, ponderosa pine, eastern white pine, bur oak.	Hackberry, Russian-olive, green ash, honeylocust, golden willow.	Eastern cottonwood.

Table 12.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
1747:					
Rodney	---	Siberian peashrub, American plum.	Russian-olive, eastern redcedar, ponderosa pine, bur oak.	Hackberry, green ash, honeylocust, golden willow.	Eastern cottonwood.
1750:					
Ticonic	Lilac	Siberian peashrub, Washington hawthorn, Russian-olive.	Hackberry, green ash, honeylocust, eastern redcedar, Osage-orange, eastern white pine, Scotch pine, bur oak.	---	---
1849:					
Kenmoor	---	Washington hawthorn, holly, American plum, nannyberry viburnum.	Green ash, eastern redcedar, sweetgum, white spruce, northern whitecedar.	Bur oak	---

Table 13.--Windbreak Suitability Groups

(See text for a description of the characteristics of the soils in each group. Absence of an entry indicates that a windbreak suitability group is not assigned. Suitable shrubs and trees with their mature heights are listed in table 12)

Map symbol and soil name	Windbreak suitability group
1C, 1C3, 1D, 1D3, 1E, 1E3, 1F, 1F3, 1G Ida	8
2G Hamburg	8
3D, 3E, 3F Castana	8
10B, 10C, 10C2, 10C3, 10D, 10D2, 10D3, 10E, 10E2, 10E3, 10F, 10F2, 10F3, 10G Monona	3
12B, 12C, 12D Napier	3
17B:	
Napier	3
Kennebec	1
Colo	2
33D Steinauer	8
33E, 33F, 33G Steinauer	10
36 Salix	3
44 Blencoe	1
46 Keg	1
54, 54+ Zook	2
66, 66+ Luton	2
67 Woodbury	2

Table 13.--Windbreak Suitability Groups--Continued

Map symbol and soil name	Windbreak suitability group
70---------- McPaul	1K
123--------- Grantcenter	1
133, 133+--- Colo	2
137--------- Haynie	1K
144--------- Blake	1K
145, 146---- Onawa	1K
147, 149---- Modale	1K
155, 156, 157-------- Albaton	2K
212, 212+--- Kennebec	1
220--------- Nodaway	1
234--------- Nishna	2K
237, 237B--- Sarpy	7
244--------- Blend	2
255--------- Cooper	1
257--------- Uturin	2K
266--------- Smithland	2
275--------- Moville	1K
366--------- Luton	2
430--------- Ackmore	1
436--------- Lakeport	1
446--------- Burcham	1K

Table 13.--Windbreak Suitability Groups--Continued

Map symbol and soil name	Windbreak suitability group
465--------- Tieville	2K
510, 510B, 510C, 510C2, 510C3------ Monona	3
514--------- Grable	1K
515--------- Percival	1K
516--------- Vore	1K
552--------- Owego	1K
553--------- Forney	2
670--------- Rawles	1K
717D:	
Napier-----	3
Gullied land.	
746--------- Lossing	1K
747--------- Rodney	2K
748--------- Hornick	1
754--------- Larpenteur	1K
945, 946---- Albaton	10
1137-------- Haynie	1K
1144-------- Blake	1K
1145, 1146-- Onawa	1K
1147, 1150-- Modale	1K
1155, 1156, 1157------- Albaton	2K

Table 13.--Windbreak Suitability Groups--Continued

Map symbol and soil name	Windbreak suitability group
1220-------- Nodaway	1
1237, 1237B- Sarpy	7
1514-------- Grable	1K
1515-------- Percival	1K
1516-------- Vore	1K
1524-------- Morconick	8
1525, 1526-- Scroll	1K
1552-------- Owego	1K
1746-------- Lossing	1K
1747-------- Rodney	2K
1750-------- Ticonic	5
1849-------- Kenmoor	1K
5010. Pits	
5040. Orthents	
5044. Fluvaquents	
5045, 5046, 5047. Aquents	
5051. Fluvaquents	
5090. Aquents-Orthents	

Forest Land

The information in table 14 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the ***ordination symbol***, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce. The number 1 indicates low potential productivity; 2 and 3, moderate; 4 and 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter ***R*** indicates steep slopes; ***X***, stoniness or rockiness; ***W***, excess water in or on the soil; ***T***, toxic substances in the soil; ***D***, restricted rooting depth; ***C***, clay in the upper part of the soil; ***S***, sandy texture; ***F***, a high content of rock fragments in the soil; and ***N***, snowpack. The letter ***A*** indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, F, and N.

In the table, ***slight, moderate,*** and ***severe*** indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, and fire lanes and in log-handling areas. Forests that have been burned or overgrazed are also subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of ***slight*** indicates that no particular prevention measures are needed under ordinary conditions. A rating of ***moderate*** indicates that erosion-control measures are needed in certain silvicultural activities. A rating of ***severe*** indicates that special precautions are needed to control erosion in most silvicultural activities.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of ***slight*** indicates that under normal conditions the kind of equipment or season of use is not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of ***moderate*** indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of ***severe*** indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of ***slight*** indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of ***moderate*** indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of ***severe*** indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of ***slight*** indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of ***moderate*** indicates that some trees can be blown down during periods when

the soil is wet and winds are moderate or strong. A rating of ***severe*** indicates that many trees can be blown down during these periods.

Plant competition ratings indicate the degree to which undesirable species are expected to invade and grow when openings are made in the tree canopy. The main factors that affect plant competition are the depth to the water table and the available water capacity. A rating of ***slight*** indicates that competition from undesirable plants is not likely to prevent natural regeneration or suppress the more desirable species. Planted seedlings can become established without undue competition. A rating of ***moderate*** indicates that competition may delay the establishment of desirable species. Competition may hamper stand development, but it will not prevent the eventual development of fully stocked stands. A rating of ***severe*** indicates that competition can be expected to prevent regeneration unless precautionary measures are applied.

The ***potential productivity*** of merchantable or ***common trees*** on a soil is expressed as a site index and as a volume number. The ***site index*** is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The ***volume of wood fiber***, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic meters per hectare per year, indicates the amount of wood fiber produced in a fully stocked, even-aged stand.

Suggested trees to plant are those that are suitable for commercial wood production.

Table 14.--Woodland Management and Productivity

(Only the soils suitable for production of commercial trees are listed)

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume of wood fiber*	Suggested trees to plant
2G:										
Hamburg	2R	Severe	Severe	Severe	Slight	Slight	Post oak	---	---	Eastern redcedar, white oak, bur oak.
							Black oak	---	---	
							Eastern redcedar	---	---	
							White oak	45	2	
							Bur oak	---	---	
17B:										
Napier.										
Kennebec	3A	Slight	Slight	Slight	Slight	Moderate	Hackberry	---	---	Hackberry, green ash, black walnut, American sycamore, eastern cottonwood, bur oak.
							Green ash	---	---	
							Black walnut	79	---	
							Eastern cottonwood	---	---	
							Bur oak	63	3	
Colo.										
137:										
Haynie	11A	Slight	Slight	Slight	Slight	Moderate	Green ash	---	---	Black walnut, eastern cottonwood.
							American sycamore	110	11	
							Black walnut	---	---	
							Eastern cottonwood	110	11	
212:										
Kennebec	3A	Slight	Slight	Slight	Slight	Moderate	Hackberry	---	---	Hackberry, green ash, black walnut, American sycamore, eastern cottonwood, bur oak.
							Green ash	---	---	
							Black walnut	79	---	
							Eastern cottonwood	---	---	
							Bur oak	63	3	
212+:										
Kennebec	3A	Slight	Slight	Slight	Slight	Moderate	Hackberry	---	---	Hackberry, green ash, black walnut, American sycamore, eastern cottonwood, bur oak.
							Green ash	---	---	
							Black walnut	79	---	
							Eastern cottonwood	---	---	
							Bur oak	63	3	
220:										
Nodaway	3A	Slight	Slight	Slight	Slight	Moderate	White oak	65	3	Sugar maple, black walnut, European larch, red pine, eastern white pine.

Table 14.--Woodland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume of wood fiber*	Suggested trees to plant
237:										
Sarpy-----------	3S	Slight	Slight	Severe	Slight	Slight	Silver maple--------	90	3	American sycamore, eastern cottonwood, black willow.
							Eastern cottonwood--	95	8	
237B:										
Sarpy-----------	3S	Slight	Slight	Severe	Slight	Slight	Silver maple--------	90	3	American sycamore, eastern cottonwood, black willow.
							Eastern cottonwood--	95	8	
430:										
Ackmore---------	4A	Slight	Slight	Slight	Slight	Moderate	White oak-----------	65	4	Sugar maple, black walnut, red pine, cottonwood.
465:										
Tieville--------	2W	Slight	Severe	Severe	Severe	Severe	Silver maple--------	---	---	Green ash, American sycamore, eastern cottonwood.
							Hackberry-----------	---	---	
							Bur oak-------------	50	2	
							Green ash-----------	---	---	
							Eastern cottonwood--	75	6	
1137:										
Haynie----------	11A	Slight	Slight	Slight	Slight	Moderate	Green ash-----------	---	---	Black walnut, eastern cottonwood.
							American sycamore---	110	11	
							Black walnut--------	---	---	
							Eastern cottonwood--	110	11	
1220:										
Nodaway---------	3A	Slight	Slight	Slight	Slight	Moderate	White oak-----------	65	3	Sugar maple, black walnut, European larch, red pine, eastern white pine.
1237:										
Sarpy-----------	8S	Slight	Slight	Severe	Slight	Slight	Eastern cottonwood--	95	8	Silver maple, American sycamore, eastern cottonwood.
1237B:										
Sarpy-----------	8S	Slight	Slight	Severe	Slight	Slight	Eastern cottonwood--	95	8	Silver maple, American sycamore, eastern cottonwood.
1750:										
Ticonic---------	8S	Slight	Slight	Severe	Slight	Slight	Silver maple--------	---	---	---
							Eastern cottonwood--	95	8	

Table 14.--Woodland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume of wood fiber*	Suggested trees to plant
1849:										
Kenmoor---------	4S	Slight	Slight	Moderate	Slight	Moderate	Green ash-----------	60	3	Green ash, sweetgum, eastern cottonwood, pin oak.
							Eastern cottonwood--	85	6	
							Pin oak-------------	75	4	

* Volume of wood fiber is the yield in cubic meters per hectare per year calculated at the age of culmination of the mean annual increment for fully stocked natural stands.

Recreation

The soils of the survey area are rated in table 15 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites, and either access to public sewer lines or the capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degrees, for recreational uses by the duration of flooding and the season when it occurs. Onsite assessment of the height, duration, intensity, and frequency of flooding is essential in planning recreational facilities.

Camp areas are tracts of land used intensively as sites for tents, trailers, and campers and for outdoor activities that accompany such sites. These areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The soils are rated on the basis of soil properties that influence the ease of developing camp areas and performance of the areas after development. Also considered are the soil properties that influence trafficability and promote the growth of vegetation after heavy use.

Picnic areas are natural or landscaped tracts of land that are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The soils are rated on the basis of soil properties that influence the cost of shaping the site, trafficability, and the growth of vegetation after development. The surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry.

Playgrounds are areas used intensively for baseball, football, or similar activities. These areas require a nearly level soil that is free of stones and that can withstand heavy foot traffic and maintain an adequate cover of vegetation. The soils are rated on the basis of soil properties that influence the cost of shaping the site, trafficability, and the growth of vegetation. Slope and stoniness are the main concerns in developing playgrounds. The surface of the playgrounds should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry.

Paths and trails are areas used for hiking and horseback riding. The areas should require little or no cutting and filling during site preparation. The soils are rated on the basis of soil properties that influence trafficability and erodibility. Paths and trails should remain firm under foot traffic and not be dusty when dry.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

The interpretive ratings in this table help engineers, planners, and others to understand how soil properties influence recreational uses. Ratings for proposed uses are given in terms of limitations. Only the most restrictive features are listed. Other features may limit a specific recreational use.

The degree of soil limitation is expressed as slight, moderate, or severe.

Slight means that soil properties are favorable for the rated use. The limitations are minor and can be easily overcome. Good performance and low maintenance are expected.

Moderate means that soil properties are moderately favorable for the rated use. The limitations can be overcome or modified by special planning, design, or maintenance. During some part of the year, the expected performance may be less desirable than that of soils rated ***slight***.

Severe means that soil properties are unfavorable for the rated use. Examples of limitations are slope,

bedrock near the surface, flooding, and a seasonal high water table. These limitations generally require major soil reclamation, special design, or intensive maintenance. Overcoming the limitations generally is difficult and costly.

The information in table 15 can be supplemented by other information in this survey, for example, interpretations for dwellings without basements and for local roads and streets in table 17 and interpretations for septic tank absorption fields in table 18.

Table 15.--Recreational Development

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1C:					
Ida	Slight	Slight	Severe: slope.	Slight	Slight.
1C3:					
Ida	Slight	Slight	Severe: slope.	Severe: erodes easily.	Slight.
1D:					
Ida	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
1D3:					
Ida	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
1E:					
Ida	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
1E3:					
Ida	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
1F:					
Ida	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1F3:					
Ida	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
1G:					
Ida	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
2G:					
Hamburg	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
3D:					
Castana	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
3E:					
Castana	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.

Table 15.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
3F:					
Castana	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
10B:					
Monona	Slight	Slight	Moderate: slope.	Slight	Slight.
10C:					
Monona	Slight	Slight	Severe: slope.	Slight	Slight.
10C2:					
Monona	Slight	Slight	Severe: slope.	Slight	Slight.
10C3:					
Monona	Slight	Slight	Severe: slope.	Severe: erodes easily.	Slight.
10D:					
Monona	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
10D2:					
Monona	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
10D3:					
Monona	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
10E:					
Monona	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
10E2:					
Monona	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
10E3:					
Monona	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
10F:					
Monona	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
10F2:					
Monona	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
10F3:					
Monona	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
10G:					
Monona	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
12B:					
Napier	Slight	Slight	Moderate: slope.	Slight	Slight.

Table 15.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
12C:					
Napier	Slight	Slight	Severe: slope.	Slight	Slight.
12D:					
Napier	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
17B:					
Napier	Slight	Slight	Moderate: slope.	Slight	Slight.
Kennebec	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
Colo	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
33D:					
Steinauer	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
33E:					
Steinauer	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
33F:					
Steinauer	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
33G:					
Steinauer	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
36:					
Salix	Severe: flooding.	Slight	Slight	Slight	Slight.
44:					
Blencoe	Severe: flooding, too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
46:					
Keg	Severe: flooding.	Slight	Slight	Slight	Slight.
54:					
Zook	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
54+:					
Zook	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
66:					
Luton	Severe: flooding, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness, percs slowly.	Severe: wetness, too clayey.	Severe: wetness, too clayey.

Table 15.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
66+: Luton	Severe: flooding, wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
67: Woodbury	Severe: flooding, wetness, too clayey.	Severe: wetness, too clayey.	Severe: too clayey, wetness.	Severe: wetness, too clayey.	Severe: wetness, too clayey.
68: Napa	Severe: flooding, wetness, percs slowly.	Severe: wetness, excess sodium	Severe: wetness, percs slowly.	Severe: wetness.	Severe: excess sodium, wetness.
70: McPaul	Severe: flooding.	Slight	Slight	Slight	Slight.
123: Grantcenter	Severe: flooding.	Moderate: wetness.	Moderate: wetness.	Slight	Slight.
133: Colo	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
133+: Colo	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
137: Haynie	Severe: flooding.	Slight	Slight	Slight	Slight.
144: Blake	Severe: flooding.	Moderate: wetness.	Moderate: wetness.	Slight	Slight.
145: Onawa	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Slight	Slight.
146: Onawa	Severe: flooding, too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
147: Modale	Severe: flooding, percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Moderate: wetness.	Moderate: wetness.
149: Modale	Severe: flooding, percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Moderate: wetness.	Moderate: wetness.

Table 15.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
155:					
Albaton	Severe: flooding, wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
156:					
Albaton	Severe: flooding, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness, percs slowly.	Severe: wetness, too clayey.	Severe: wetness, too clayey.
157:					
Albaton	Severe: flooding, wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
212:					
Kennebec	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
212+:					
Kennebec	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
220:					
Nodaway	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
234:					
Nishna	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
237:					
Sarpy	Severe: flooding.	Slight	Slight	Slight	Moderate: droughty.
237B:					
Sarpy	Severe: flooding.	Slight	Moderate: slope.	Slight	Moderate: droughty.
244:					
Blend	Severe: flooding, percs slowly, too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey, percs slowly.	Severe: too clayey.	Severe: too clayey.
255:					
Cooper	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
257:					
Uturin	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
266:					
Smithland	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.

Table 15.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
275:					
Moville	Severe: flooding, percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Moderate: wetness.	Moderate: wetness.
366:					
Luton	Severe: flooding, wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
430:					
Ackmore	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Slight	Moderate: flooding.
436:					
Lakeport	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Slight	Slight.
446:					
Burcham	Severe: flooding, percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Moderate: wetness.	Moderate: wetness.
465:					
Tieville	Severe: flooding, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness.	Severe: wetness, too clayey.	Severe: wetness, too clayey.
510:					
Monona	Slight	Slight	Slight	Slight	Slight.
510B:					
Monona	Slight	Slight	Moderate: slope.	Slight	Slight.
510C:					
Monona	Slight	Slight	Severe: slope.	Slight	Slight.
510C2:					
Monona	Slight	Slight	Severe: slope.	Slight	Slight.
510C3:					
Monona	Slight	Slight	Severe: slope.	Severe: erodes easily.	Slight.
514:					
Grable	Severe: flooding.	Slight	Slight	Slight	Slight.
515:					
Percival	Severe: flooding, too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
516:					
Vore	Severe: flooding.	Slight	Slight	Slight	Slight.

Table 15.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
552:					
Owego	Severe: flooding, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness.	Severe: wetness, too clayey.	Severe: wetness, too clayey.
553:					
Forney	Severe: flooding, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness.	Severe: wetness, too clayey.	Severe: wetness, too clayey.
670:					
Rawles	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
717D:					
Napier	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Gullied land.					
746:					
Lossing	Severe: flooding, too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
747:					
Rodney	Severe: flooding, wetness, too clayey.	Severe: wetness, too clayey.	Severe: too clayey, wetness.	Severe: wetness, too clayey.	Severe: wetness, too clayey.
748:					
Hornick	Severe: flooding, too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
754:					
Larpenteur	Severe: flooding.	Moderate: wetness.	Moderate: wetness.	Slight	Slight.
945:					
Albaton	Severe: flooding, ponding, percs slowly.	Severe: ponding, too clayey, percs slowly.	Severe: too clayey, ponding, flooding.	Severe: ponding, too clayey.	Severe: ponding, flooding, too clayey.
946:					
Albaton	Severe: flooding, ponding, percs slowly.	Severe: ponding, too clayey, percs slowly.	Severe: too clayey, ponding, flooding.	Severe: ponding, too clayey.	Severe: ponding, flooding, too clayey.
1137:					
Haynie	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
1144:					
Blake	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Slight	Moderate: flooding.

Table 15.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1145:					
Onawa	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: wetness, flooding.	Slight	Moderate: flooding.
1146:					
Onawa	Severe: flooding, too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
1147:					
Modale	Severe: flooding, percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Moderate: wetness.	Moderate: wetness, flooding.
1150:					
Modale	Severe: flooding, percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Moderate: wetness.	Moderate: wetness, flooding.
1155:					
Albaton	Severe: flooding, wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
1156:					
Albaton	Severe: flooding, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness, percs slowly.	Severe: wetness, too clayey.	Severe: wetness, too clayey.
1157:					
Albaton	Severe: flooding, wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
1220:					
Nodaway	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
1237:					
Sarpy	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: droughty, flooding.
1237B:					
Sarpy	Severe: flooding.	Slight	Moderate: slope, flooding.	Slight	Moderate: droughty, flooding.
1514:					
Grable	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
1515:					
Percival	Severe: flooding, too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.

Table 15.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1516: Vore	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
1524: Morconick	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: droughty, flooding.
1525: Scroll	Severe: flooding, too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
1526: Scroll	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: wetness, flooding.	Slight	Moderate: droughty, flooding.
1552: Owego	Severe: flooding, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness.	Severe: wetness, too clayey.	Severe: wetness, too clayey.
1746: Lossing	Severe: flooding, too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
1747: Rodney	Severe: flooding, wetness, too clayey.	Severe: wetness, too clayey.	Severe: too clayey, wetness.	Severe: wetness, too clayey.	Severe: wetness, too clayey.
1750: Ticonic	Severe: flooding, too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, flooding.
1849: Kenmoor	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: wetness, flooding.	Slight	Moderate: droughty, flooding.
5010: Pits	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
5040: Orthents	Slight	Slight	Slight	Slight	Slight.
5044: Fluvaquents.					
5045: Aquents	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

Table 15.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
5046:					
Aquents---------	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
5047:					
Aquents---------	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
5051:					
Fluvaquents-----	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
5090:					
Aquents---------	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Orthents.					

Wildlife Habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. If food, cover, or water is missing, inadequate, or inaccessible, wildlife will be scarce or will not inhabit the area.

If the soils have potential for habitat development, wildlife habitat can be created or improved by planting appropriate vegetation, properly managing the existing plant cover, and fostering the natural establishment of desirable plants.

Monona County has a wide range of soil types and landforms that provide a diversity of wildlife habitat, including the steep, arid loess hills and the low, wet riparian areas along the Missouri, Maple, Soldier, and Little Sioux Rivers. Approximately 70 percent of the county is currently used for agricultural production. Other areas of the county are available for wildlife habitation. These areas include fence rows, road ditches, areas enrolled in the Conservation Reserve Program, turn-strips, grassed waterways, pastures, woodlots, and stream borders.

Locating water is the main obstacle for wildlife in the loess hills. Manmade water impoundments have provided a steady source of water for many species of wildlife that inhabit this area.

Because of the steep topography, areas of the loess hills adjacent to the bottom land along the Missouri River have not been cultivated, and some areas of native prairie grass still exist. Much of the original prairie vegetation has been destroyed by grazing of domesticated livestock. Trees have grown in numbers as the native grasses have been removed and the areas abandoned.

Wildlife species common in the hills are white-tailed deer, raccoon, coyote, opossum, skunk, cottontail rabbit, squirrel, badger, red fox, plains pocket mouse, western harvest mouse, white-footed mouse, prairie deer mouse, and prairie vole. Common birds include redtail hawks, turkey vulture, bobwhite quail, wild turkey, owls, ring-necked pheasants, mourning doves, robins, eastern kingbirds, killdeer, American goldfinch, northern oriole, bluejays, and cardinals. Other species include the prairie rattler, tiger salamander, Great Plains toad, Woodhouse’s toad, plains leopard frog, and plains spadefoot. Various butterfly species also inhabit the loess hills. These include the Dakota skipper, Poweshiek skipperling, Otoe skipper, dusted skipper, Pawnee skipper, regal fritillary, hickory hairstreak, spicebush swallowtail, hoary edge, Henry’s elfin, and Olympia marblewing.

Riparian areas adjacent to the Missouri River and its tributaries provide habitat for such wildlife as snapping turtles, beavers, muskrat, and mink. The Missouri River is a flyway for migratory birds, such as bald eagles, northern shovelers, great blue heron, Canada geese, snow geese, and mallards. Other species that inhabit the riparian areas include peregrine falcon, interior least tern, piping plover, lake sturgeon, pallid sturgeon, catfish, suckers, bream, and paddlefish.

In table 16, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of ***good*** indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of ***fair*** indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of ***poor*** indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of ***very poor*** indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and

seed-producing herbaceous plants used by wildlife. Examples are corn, soybeans, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes planted for wildlife food and cover. Examples are bromegrass, timothy, orchardgrass, clover, alfalfa, wheatgrass, and birdsfoot trefoil.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Examples are bluestems, indiangrass, goldenrod, lambsquarters, dandelions, ragweed, wheatgrass, and nightshade.

The major soil properties affecting the growth of grain and forage crops and wild herbaceous plants are depth of the root zone, texture of the surface layer, the amount of water available to plants, wetness, salinity, and flooding. The length of the growing season also is important.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage that wildlife eat. Examples are bur oak, post oak, white oak, black oak, and eastern redcedar. Purple coneflowers grow in the hills, and willow and cottonwood are common in areas of bottom land. Examples of fruit-producing shrubs that are suitable for planting on soils that have good potential for these plants are elderberry, raspberry, gooseberry, honeysuckle, American plum, dogwoods, highbush cranberry, crabapple, mulberry, and chokecherry.

Coniferous plants are cone-bearing trees, shrubs, or ground-cover plants that provide habitat or supply food in the form of browse, seed, or fruitlike cones. Examples are redcedar and spruce.

The major soil properties affecting the growth of hardwood and coniferous trees and shrubs are depth of the root zone, the amount of water available to plants, and wetness.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Wetland plants produce food or cover for wetland wildlife. Examples of these plants are smartweeds, wild millet, rushes, sedges, bulrushes, arrowhead, water plantain, cattail, prairie cordgrass, bluejoint grass, asters, and beggarticks.

The major soil properties affecting wetland plants are texture of the surface layer, wetness, acidity or alkalinity, and slope.

Shallow water areas have an average depth of less than 5 feet. They are useful as habitat for some wildlife species. They are naturally wet areas or are created by dams, levees, or water-control measures in marshes or streams. Examples are waterfowl feeding areas, wildlife watering developments, beaver ponds, and other wildlife ponds.

The major soil properties affecting shallow water areas are soil texture, wetness, slope, and permeability.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, and shrubs. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include Hungarian partridge, ring-necked pheasant, bobwhite quail, meadowlark, field sparrow, killdeer, cottontail rabbit, and red fox.

Habitat for woodland wildlife consists of areas of hardwoods or conifers or a mixture of these and associated grasses, legumes, and wild herbaceous plants. The wildlife attracted to this habitat include wild turkey, ruffed grouse, thrushes, woodpeckers, owls, tree squirrels, wild turkeys, raccoon, and white-tailed deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas, bogs, or flood plains that support water-tolerant plants. The wildlife attracted to this habitat include ducks, geese, herons, bitterns, rails, kingfishers, muskrat, otter, mink, and beaver.

Table 16.--Wildlife Habitat

(See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
1C:										
Ida	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
1C3:										
Ida	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
1D:										
Ida	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
1D3:										
Ida	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
1E:										
Ida	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
1E3:										
Ida	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
1F:										
Ida	Poor	Fair	Good	Poor	Poor	Very poor.	Very poor.	Fair	Fair	Very poor.
1F3:										
Ida	Poor	Fair	Good	Poor	Poor	Very poor.	Very poor.	Fair	Fair	Very poor.
1G:										
Ida	Very poor.	Very poor.	Good	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
2G:										
Hamburg	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
3D:										
Castana	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
3E:										
Castana	Poor	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
3F:										
Castana	Poor	Fair	Good	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.
10B:										
Monona	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

Table 16.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
10C: Monona	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
10C2: Monona	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
10C3: Monona	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
10D: Monona	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
10D2: Monona	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
10D3: Monona	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
10E: Monona	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
10E2: Monona	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
10E3: Monona	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
10F: Monona	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
10F2: Monona	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
10F3: Monona	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
10G: Monona	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
12B: Napier	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
12C: Napier	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

Table 16.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
12D:										
Napier----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
17B:										
Napier----------	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Kennebec--------	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Colo------------	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
33D:										
Steinauer-------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
33E:										
Steinauer-------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
33F:										
Steinauer-------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
33G:										
Steinauer-------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
36:										
Salix-----------	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
44:										
Blencoe---------	Good	Good	Good	Fair	Poor	Good	Good	Good	Fair	Good.
46:										
Keg-------------	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
54:										
Zook------------	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
54+:										
Zook------------	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
66:										
Luton-----------	Fair	Fair	Fair	Poor	Very poor.	Good	Good	Fair	Poor	Good.
66+:										
Luton-----------	Fair	Fair	Fair	Poor	Very poor.	Good	Good	Fair	Poor	Good.
67:										
Woodbury--------	Fair	Fair	Fair	Poor	Very poor.	Good	Good	Fair	Poor	Good.
68:										
Napa------------	Very poor.	Very poor.	Fair	Poor	Very poor.	Poor	Poor	Very poor.	Very poor.	Poor.

Table 16.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hard-wood trees	Conif-erous plants	Wetland plants	Shallow water areas	Open-land wild-life	Wood-land wild-life	Wetland wild-life
70: McPaul	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
123: Grantcenter	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
133: Colo	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
133+: Colo	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
137: Haynie	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
144: Blake	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good.
145: Onawa	Fair	Fair	Fair	Poor	Very poor.	Good	Good	Fair	Poor	Good.
146: Onawa	Fair	Fair	Fair	Poor	Very poor.	Good	Good	Fair	Poor	Good.
147: Modale	Good	Good	Good	Good	Fair	Good	Good	Good	Good	Good.
149: Modale	Good	Good	Good	Good	Fair	Good	Good	Good	Good	Good.
155: Albaton	Fair	Fair	Fair	Poor	Very poor.	Good	Good	Fair	Poor	Good.
156: Albaton	Fair	Fair	Fair	Poor	Very poor.	Good	Good	Fair	Poor	Good.
157: Albaton	Fair	Fair	Fair	Poor	Very poor.	Good	Good	Fair	Poor	Good.
212: Kennebec	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
212+: Kennebec	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
220: Nodaway	Good	Good	Good	Good	Fair	Fair	Poor	Fair	Good	Fair.
234: Nishna	Fair	Fair	Fair	Poor	Very poor.	Good	Good	Fair	Poor	Good.
237: Sarpy	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.

Table 16.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hard-wood trees	Conif-erous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Open-land wild-life	Wood-land wild-life	Wetland wild-life
237B: Sarpy	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
244: Blend	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
255: Cooper	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
257: Uturin	Fair	Fair	Fair	Poor	Very poor.	Good	Good	Fair	Poor	Good.
266: Smithland	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
275: Moville	Good	Good	Good	---	---	Good	Good	Good	Good	Good.
366: Luton	Fair	Fair	Fair	Poor	Very poor.	Good	Good	Fair	Poor	Good.
430: Ackmore	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
436: Lakeport	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
446: Burcham	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
465: Tieville	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
510: Monona	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
510B: Monona	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
510C: Monona	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
510C2: Monona	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
510C3: Monona	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
514: Grable	Good	Good	Good	Good	Fair	Poor	Very poor.	Good	Good	Very poor.

Table 16.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
515:										
Percival	Fair	Fair	Fair	Fair	Poor	Fair	Fair	Fair	Fair	Fair.
516:										
Vore	Good	Good	Good	Good	Fair	Fair	Fair	Good	Good	Fair.
552:										
Owego	Fair	Fair	Fair	Poor	Very poor.	Good	Good	Fair	Poor	Good.
553:										
Forney	Fair	Fair	Fair	Poor	Very poor.	Good	Good	Fair	Poor	Good.
670:										
Rawles	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
717D:										
Napier	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Gullied land.										
746:										
Lossing	Fair	Fair	Fair	Poor	Very poor.	Good	Good	Fair	Poor	Fair.
747:										
Rodney	Fair	Fair	Fair	Poor	Very poor.	Good	Good	Good	Fair	Good.
748:										
Hornick	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
754:										
Larpenteur	Good	Good	Good	Good	Fair	Fair	Fair	Good	Good	Fair.
945:										
Albaton	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
946:										
Albaton	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
1137:										
Haynie	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
1144:										
Blake	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good.
1145:										
Onawa	Fair	Fair	Fair	Poor	Very poor.	Good	Good	Fair	Poor	Good.
1146:										
Onawa	Fair	Fair	Fair	Poor	Very poor.	Good	Good	Fair	Poor	Good.

Table 16.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
1147: Modale	Good	Good	Good	Good	Fair	Good	Good	Good	Good	Good.
1150: Modale	Good	Good	Good	Good	Fair	Good	Good	Good	Good	Good.
1155: Albaton	Fair	Fair	Fair	Poor	Very poor.	Good	Good	Fair	Poor	Good.
1156: Albaton	Fair	Fair	Fair	Poor	Very poor.	Good	Good	Fair	Poor	Good.
1157: Albaton	Fair	Fair	Fair	Poor	Very poor.	Good	Good	Fair	Poor	Good.
1220: Nodaway	Poor	Fair	Fair	Poor	Poor	Good	Fair	Poor	Poor	Fair.
1237: Sarpy	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
1237B: Sarpy	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
1514: Grable	Good	Good	Good	Good	Fair	Poor	Very poor.	Good	Good	Very poor.
1515: Percival	Fair	Fair	Fair	Fair	Poor	Fair	Fair	Fair	Fair	Fair.
1516: Vore	Good	Good	Good	Good	Fair	Fair	Fair	Good	Good	Fair.
1524: Morconick	Good	Good	Good	Good	Fair	Poor	Very poor.	Good	Good	Very poor.
1525: Scroll	Fair	Fair	Fair	Fair	Poor	Fair	Fair	Fair	Fair	Fair.
1526: Scroll	Fair	Fair	Fair	Fair	Poor	Fair	Fair	Fair	Fair	Fair.
1552: Owego	Fair	Fair	Fair	Poor	Very poor.	Good	Good	Fair	Poor	Good.
1746: Lossing	Fair	Fair	Fair	Poor	Very poor.	Good	Good	Fair	Poor	Fair.
1747: Rodney	Fair	Fair	Fair	Poor	Very poor.	Good	Good	Good	Fair	Good.

Table 16.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
1750:										
Ticonic---------	Poor	Fair	Fair	Good	Good	Poor	Fair	Fair	Fair	Poor.
1849:										
Kenmoor---------	Poor	Fair	Fair	Good	Good	Poor	Fair	Fair	Fair	Poor.
5010:										
Pits------------	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
5040:										
Orthents.										
5044:										
Fluvaquents.										
5045, 5046, 5047:										
Aquents.										
5051:										
Fluvaquents-----	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
5090:										
Aquents-Orthents.										

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the data in the tables described under the heading "Soil Properties."

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 17 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered ***slight*** if soil properties and site features generally are favorable for the indicated use and limitations are minor and easily overcome; ***moderate*** if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and ***severe*** if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves,

utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and ***small commercial buildings*** are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills generally are limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential (fig. 15), potential for frost action, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock, the available water capacity in the upper 40 inches, and the content of salts affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 18 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. It also shows the suitability of the soils for use as a daily cover for landfill.

Soil properties are important in selecting sites for sanitary facilities and in identifying limiting soil properties and site features to be considered in planning, design, and installation. Soil limitation ratings of ***slight, moderate,*** or ***severe*** are given for septic tank absorption fields, sewage lagoons, and trench and area sanitary landfills. Soil suitability ratings of ***good, fair,*** and ***poor*** are given for daily cover for landfill.

A rating of ***slight*** or ***good*** indicates that the soils have no limitations or that the limitations can be easily overcome. Good performance and low maintenance can be expected. A rating of ***moderate*** or ***fair*** indicates that the limitations should be recognized but generally can be overcome by good management or special design. A rating of ***severe*** or ***poor*** indicates that overcoming the limitations is difficult or impractical. Increased maintenance may be required.

Septic tank absorption fields are areas in which subsurface systems of tile or perforated pipe distribute effluent from a septic tank into the natural soil. The centerline of the tile is assumed to be at a depth of 24 inches. Only the part of the soil between depths of 24 and 60 inches is considered in making the ratings. The soil properties and site features considered are those that affect the absorption of the effluent, those that affect the construction and maintenance of the system, and those that may affect public health.

The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to

Figure 15.—An area of Luton silty clay, 0 to 1 percent slopes, rarely flooded. The high shrink-swell potential can damage roads, building foundations, and utility lines.

hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted, relatively impervious soil material. Aerobic lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Relatively impervious soil material for the lagoon floor and sides is desirable to minimize seepage and contamination of local ground water.

Table 18 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope and bedrock can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Trench sanitary landfill is an area where solid waste is disposed of by placing refuse in successive layers in an excavated trench. The waste is spread, compacted, and covered daily with a thin layer of soil that is excavated from the trench. When the trench is full, a final cover of soil material at least 2 feet thick is placed over the landfill. Soil properties that influence the risk of pollution, the ease of excavation, trafficability, and revegetation are the major considerations in rating the soils.

Area sanitary landfill is an area where solid waste is disposed of by placing refuse in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil that is imported from a source away from the site. A final cover of soil at least 2 feet thick is placed over the completed landfill. Soil properties that influence trafficability, revegetation, and the risk of pollution are the main considerations in rating the soils for area sanitary landfills.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. The ratings in the table are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste. The suitability of a soil for use as cover is based on properties that affect workability and the ease of digging, moving, and spreading the material over the refuse daily during both wet and dry periods.

Soil texture, wetness, rock fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Waste Management

Soil properties are important when organic waste is applied as fertilizer and wastewater is applied in irrigated areas. They also are important when the soil is used as a medium for the treatment and disposal of the organic waste and wastewater. Unfavorable soil properties can result in environmental damage.

The use of organic waste and wastewater as production resources results in energy and resource conservation and minimizes the problems associated with waste disposal. If disposal is the goal, applying a maximum amount of the organic waste or the wastewater to a minimal area holds costs to a minimum and environmental damage is the main hazard. If reuse is the goal, a minimum amount should be applied to a maximum area and environmental damage is unlikely.

Interpretations developed for waste management may include ratings for manure- and food-processing waste, municipal sewage sludge, use of wastewater for irrigation, and treatment of wastewater by slow rate, overland flow, and rapid infiltration processes.

Specific information regarding waste management is available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Construction Materials

Table 19 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated ***good, fair,*** or ***poor*** as a source of roadfill and topsoil. They are rated as a ***probable*** or ***improbable*** source of sand and gravel.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In the table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavation and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can

help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated ***good*** contain significant amounts of sand or gravel, or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated ***fair*** are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated ***poor*** have one or more of the following characteristics: a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and ***gravel*** are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In the table, only the probability of finding material in suitable quantity in or below the soil is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is as much as 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated ***good*** have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated ***fair*** are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated ***poor*** are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils generally is preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 20 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered ***slight*** if soil properties and site features generally are favorable for the indicated use and limitations are minor and are easily overcome; ***moderate*** if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and ***severe*** if soil properties or site features are so unfavorable or so difficult to

overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In the table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even more than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock. The performance of a system is affected by the depth of the root zone, the amount of salts, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff.

Slope, wetness, large stones, and depth to bedrock affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind erosion or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Table 17.--Building Site Development

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1C:						
Ida	Slight	Slight	Slight	Moderate: slope.	Severe: low strength, frost action.	Slight.
1C3:						
Ida	Slight	Slight	Slight	Moderate: slope.	Severe: low strength, frost action.	Slight.
1D:						
Ida	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
1D3:						
Ida	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
1E:						
Ida	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
1E3:						
Ida	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
1F:						
Ida	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
1F3:						
Ida	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
1G:						
Ida	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
2G:						
Hamburg	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.	Severe: slope.

Table 17.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
3D:						
Castana	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
3E:						
Castana	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
3F:						
Castana	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
10B:						
Monona	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
10C:						
Monona	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
10C2:						
Monona	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
10C3:						
Monona	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
10D:						
Monona	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
10D2:						
Monona	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
10D3:						
Monona	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
10E:						
Monona	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
10E2:						
Monona	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.

Table 17.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
10E3:						
Monona	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
10F:						
Monona	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
10F2:						
Monona	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
10F3:						
Monona	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
10G:						
Monona	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
12B:						
Napier	Slight	Slight	Slight	Slight	Severe: low strength, frost action.	Slight.
12C:						
Napier	Slight	Slight	Slight	Moderate: slope.	Severe: low strength, frost action.	Slight.
12D:						
Napier	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
17B:						
Napier	Slight	Slight	Slight	Slight	Severe: low strength, frost action.	Slight.
Kennebec	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.
Colo	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.

Table 17.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
33D:						
Steinauer-------	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
33E:						
Steinauer-------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
33F:						
Steinauer-------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
33G:						
Steinauer-------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
36:						
Salix-----------	Moderate: wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, frost action.	Slight.
44:						
Blencoe---------	Severe: wetness.	Severe: flooding, shrink-swell.	Severe: flooding, wetness.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Severe: too clayey.
46:						
Keg-------------	Slight---------	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, frost action.	Slight.
54:						
Zook------------	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
54+:						
Zook------------	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
66:						
Luton-----------	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
66+:						
Luton-----------	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength.	Moderate: wetness.

Table 17.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
67:						
Woodbury	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
68:						
Napa	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: excess sodium, wetness.
70:						
McPaul	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, frost action.	Slight.
123:						
Grantcenter	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, frost action.	Slight.
133:						
Colo	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
133+:						
Colo	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
137:						
Haynie	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, frost action.	Slight.
144:						
Blake	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, frost action.	Slight.
145:						
Onawa	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, frost action.	Slight.
146:						
Onawa	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, frost action.	Severe: too clayey.
147:						
Modale	Severe: wetness.	Severe: flooding, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength.	Moderate: wetness.

Table 17.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
149:						
Modale----------	Severe: wetness.	Severe: flooding, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength.	Moderate: wetness.
155:						
Albaton---------	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
156:						
Albaton---------	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness, too clayey.
157:						
Albaton---------	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
212:						
Kennebec--------	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.
212+:						
Kennebec--------	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.
220:						
Nodaway---------	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.
234:						
Nishna----------	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Moderate: wetness, flooding.
237:						
Sarpy-----------	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: droughty.
237B:						
Sarpy-----------	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: droughty.
244:						
Blend-----------	Moderate: too clayey, wetness.	Severe: flooding.	Severe: flooding, shrink-swell.	Severe: flooding.	Severe: low strength, frost action.	Severe: too clayey.

Table 17.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
255:						
Cooper----------	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness, shrink-swell.	Severe: flooding.	Severe: low strength, frost action.	Slight.
257:						
Uturin----------	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Moderate: wetness, flooding.
266:						
Smithland-------	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
275:						
Moville---------	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness.	Severe: low strength, frost action.	Moderate: wetness.
366:						
Luton-----------	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength.	Moderate: wetness.
430:						
Ackmore---------	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
436:						
Lakeport--------	Severe: wetness.	Severe: flooding, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Slight.
446:						
Burcham---------	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness, shrink-swell.	Severe: flooding.	Severe: low strength, frost action.	Slight.
465:						
Tieville--------	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	
510:						
Monona----------	Slight---------	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
510B:						
Monona----------	Slight---------	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.

Table 17.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
510C:						
Monona----------	Slight---------	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
510C2:						
Monona----------	Slight---------	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
510C3:						
Monona----------	Slight---------	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
514:						
Grable----------	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
515:						
Percival--------	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Moderate: wetness, flooding, frost action.	Severe: too clayey.
516:						
Vore------------	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: frost action.	Slight.
552:						
Owego-----------	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
553:						
Forney----------	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness, too clayey.
670:						
Rawles----------	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.
717D:						
Napier----------	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
Gullied land.						
746:						
Lossing---------	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, frost action.	Severe: too clayey.

Table 17.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
747:						
Rodney	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness.	Severe: low strength, frost action.	Severe: too clayey.
748:						
Hornick	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, frost action.	Severe: too clayey.
754:						
Larpenteur	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: frost action.	Slight.
945:						
Albaton	Severe: ponding.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding, flooding, too clayey.
946:						
Albaton	Severe: ponding.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding, flooding, too clayey.
1137:						
Haynie	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.
1144:						
Blake	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.
1145:						
Onawa	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.
1146:						
Onawa	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, flooding, frost action.	Severe: too clayey.
1147:						
Modale	Severe: wetness.	Severe: flooding, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Moderate: wetness, flooding.
1150:						
Modale	Severe: wetness.	Severe: flooding, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Moderate: wetness, flooding.

Table 17.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1155:						
Albaton----------	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
1156:						
Albaton----------	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness, too clayey.
1157:						
Albaton----------	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
1220:						
Nodaway----------	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Severe: flooding.
1237:						
Sarpy------------	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: droughty, flooding.
1237B:						
Sarpy------------	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: droughty, flooding.
1514:						
Grable-----------	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
1515:						
Percival---------	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Severe: too clayey.
1516:						
Vore-------------	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.	Moderate: flooding.
1524:						
Morconick--------	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: droughty, flooding.
1525:						
Scroll-----------	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Severe: too clayey.
1526:						
Scroll-----------	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Moderate: droughty, flooding.

Table 17.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1552:						
Owego	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Severe: too clayey.
1746:						
Lossing	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, flooding, frost action.	Severe: too clayey.
1747:						
Rodney	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Severe: too clayey.
1750:						
Ticonic	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: droughty, flooding.
1849:						
Kenmoor	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness, shrink-swell.	Severe: flooding.	Severe: flooding.	Moderate: droughty, flooding.
5010:						
Pits	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
5040:						
Orthents	Slight	Slight	Slight	Slight	Slight	Slight.
5044:						
Fluvaquents.						
5045:						
Aquents	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding.
5046:						
Aquents	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.
5047:						
Aquents	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness.
5051:						
Fluvaquents	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, flooding.	

Table 17.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
5090:						
Aquents	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding.
Orthents.						

Table 18.--Sanitary Facilities

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1C:					
Ida	Slight	Severe: slope.	Slight	Slight	Good.
1C3:					
Ida	Slight	Severe: slope.	Slight	Slight	Good.
1D:					
Ida	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
1D3:					
Ida	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
1E:					
Ida	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
1E3:					
Ida	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
1F:					
Ida	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
1F3:					
Ida	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
1G:					
Ida	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
2G:					
Hamburg	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
3D:					
Castana	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
3E:					
Castana	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
3F:					
Castana	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
10B:					
Monona	Slight	Moderate: seepage, slope.	Slight	Slight	Good.

Table 18.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
10C:					
Monona	Slight	Severe: slope.	Slight	Slight	Good.
10C2:					
Monona	Slight	Severe: slope.	Slight	Slight	Good.
10C3:					
Monona	Slight	Severe: slope.	Slight	Slight	Good.
10D:					
Monona	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
10D2:					
Monona	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
10D3:					
Monona	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
10E:					
Monona	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
10E2:					
Monona	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
10E3:					
Monona	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
10F:					
Monona	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
10F2:					
Monona	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
10F3:					
Monona	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
10G:					
Monona	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
12B:					
Napier	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
12C:					
Napier	Slight	Severe: slope.	Slight	Slight	Good.

Table 18.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
12D:					
Napier----------	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
17B:					
Napier----------	Slight-----------	Moderate: seepage, slope.	Slight-----------	Slight-----------	Good.
Kennebec--------	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Colo------------	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
33D:					
Steinauer-------	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Poor: hard to pack.
33E:					
Steinauer-------	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: hard to pack, slope.
33F:					
Steinauer-------	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: hard to pack, slope.
33G:					
Steinauer-------	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: hard to pack, slope.
36:					
Salix-----------	Moderate: flooding, wetness, percs slowly.	Moderate: seepage, wetness.	Severe: wetness.	Moderate: flooding, wetness.	Good.
44:					
Blencoe---------	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Fair: wetness.
46:					
Keg-------------	Moderate: flooding, percs slowly.	Moderate: seepage.	Moderate: flooding.	Moderate: flooding.	Good.
54:					
Zook------------	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.

Table 18.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
54+:					
Zook-----------	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
66:					
Luton----------	Severe: wetness, percs slowly.	Slight-----------	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
66+:					
Luton----------	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
67:					
Woodbury--------	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
68:					
Napa-----------	Severe: wetness, percs slowly.	Slight-----------	Severe: wetness, too clayey, excess sodium	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
70:					
McPaul----------	Moderate: flooding, percs slowly.	Moderate: seepage.	Moderate: flooding.	Moderate: flooding.	Good.
123:					
Grantcenter-----	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Fair: too clayey, wetness.
133:					
Colo-----------	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
133+:					
Colo-----------	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
137:					
Haynie----------	Moderate: flooding, percs slowly.	Moderate: seepage.	Moderate: flooding.	Moderate: flooding.	Good.
144:					
Blake----------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
145:					
Onawa----------	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: wetness.

Table 18.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
146:					
Onawa	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: wetness.
147:					
Modale	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey.	Moderate: flooding, wetness.	Poor: too clayey, hard to pack.
149:					
Modale	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey.	Moderate: flooding, wetness.	Poor: too clayey, hard to pack.
155:					
Albaton	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
156:					
Albaton	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
157:					
Albaton	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
212:					
Kennebec	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
212+:					
Kennebec	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
220:					
Nodaway	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
234:					
Nishna	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
237:					
Sarpy	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
237B:					
Sarpy	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.

Table 18.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
244:					
Blend	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
255:					
Cooper	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey.	Moderate: flooding, wetness.	Poor: too clayey, hard to pack.
257:					
Uturin	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
266:					
Smithland	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
275:					
Moville	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey.	Moderate: flooding, wetness.	Poor: too clayey, hard to pack.
366:					
Luton	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
430:					
Ackmore	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack.
436:					
Lakeport	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
446:					
Burcham	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey.	Moderate: flooding, wetness.	Poor: too clayey, hard to pack.
465:					
Tieville	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
510:					
Monona	Slight	Moderate: seepage.	Slight	Slight	Good.
510B:					
Monona	Slight	Moderate: seepage, slope.	Slight	Slight	Good.

Table 18.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
510C:					
Monona	Slight	Severe: slope.	Slight	Slight	Good.
510C2:					
Monona	Slight	Severe: slope.	Slight	Slight	Good.
510C3:					
Monona	Slight	Severe: slope.	Slight	Slight	Good.
514:					
Grable	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
515:					
Percival	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy.
516:					
Vore	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy.
552:					
Owego	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
553:					
Forney	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
670:					
Rawles	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
717D:					
Napier	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Gullied land.					
746:					
Lossing	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Fair: wetness.
747:					
Rodney	Severe: wetness, percs slowly.	Severe: seepage.	Severe: wetness, too clayey.	Severe: seepage, wetness.	Poor: too clayey, hard to pack, wetness.

Table 18.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
748:					
Hornick---------	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
754:					
Larpenteur------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
945:					
Albaton---------	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding, too clayey.	Severe: flooding, ponding.	Poor: too clayey, hard to pack, ponding.
946:					
Albaton---------	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding, too clayey.	Severe: flooding, ponding.	Poor: too clayey, hard to pack, ponding.
1137:					
Haynie----------	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
1144:					
Blake-----------	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
1145:					
Onawa-----------	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Fair: wetness.
1146:					
Onawa-----------	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Fair: wetness.
1147:					
Modale----------	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding.	Poor: too clayey, hard to pack.
1150:					
Modale----------	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding.	Poor: too clayey, hard to pack.
1155:					
Albaton---------	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.

Table 18.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1156:					
Albaton---------	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
1157:					
Albaton---------	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
1220:					
Nodaway---------	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
1237:					
Sarpy-----------	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy.
1237B:					
Sarpy-----------	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy.
1514:					
Grable----------	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy.
1515:					
Percival--------	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy.
1516:					
Vore------------	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy.
1524:					
Morconick-------	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding.	Poor: seepage, too sandy.
1525:					
Scroll----------	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage.

Table 18.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1526:					
Scroll----------	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage.
1552:					
Owego-----------	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
1746:					
Lossing---------	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, seepage, wetness.	Fair: wetness.
1747:					
Rodney----------	Severe: flooding, wetness, percs slowly.	Severe: seepage, flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, seepage, wetness.	Poor: too clayey, hard to pack, wetness.
1750:					
Ticonic---------	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding.	Severe: flooding, seepage.	Poor: thin layer.
1849:					
Kenmoor---------	Severe: flooding, wetness, percs slowly.	Severe: seepage, flooding.	Severe: flooding, too clayey.	Severe: flooding, seepage.	Poor: too clayey, hard to pack.
5010:					
Pits------------	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
5040:					
Orthents--------	Moderate: percs slowly.	Moderate: seepage.	Slight------------	Slight------------	Good.
5044:					
Fluvaquents.					
5045:					
Aquents---------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
5046:					
Aquents---------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
5047:					
Aquents---------	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.

Table 18.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
5051:					
Fluvaquents-----	Severe: flooding, ponding, percs slowly.	Severe: seepage, flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, seepage, ponding.	Poor: ponding.
5090:					
Aquents---------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Orthents.					

Table 19.--Construction Materials

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1C:				
Ida	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
1C3:				
Ida	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
1D:				
Ida	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
1D3:				
Ida	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
1E:				
Ida	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
1E3:				
Ida	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
1F:				
Ida	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
1F3:				
Ida	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
1G:				
Ida	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
2G:				
Hamburg	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
3D:				
Castana	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
3E:				
Castana	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
3F:				
Castana	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

Table 19.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
10B:				
Monona----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
10C:				
Monona----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
10C2:				
Monona----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
10C3:				
Monona----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
10D:				
Monona----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
10D2:				
Monona----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
10D3:				
Monona----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
10E:				
Monona----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
10E2:				
Monona----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
10E3:				
Monona----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
10F:				
Monona----------	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
10F2:				
Monona----------	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
10F3:				
Monona----------	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
10G:				
Monona----------	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

Table 19.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
12B:				
Napier----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
12C:				
Napier----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
12D:				
Napier----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
17B:				
Napier----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Kennebec--------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Colo------------	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
33D:				
Steinauer-------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones, slope.
33E:				
Steinauer-------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
33F:				
Steinauer-------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
33G:				
Steinauer-------	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
36:				
Salix-----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
44:				
Blencoe---------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
46:				
Keg-------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
54:				
Zook------------	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

Table 19.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
54+:				
Zook------------	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
66:				
Luton-----------	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
66+:				
Luton-----------	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
67:				
Woodbury--------	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
68:				
Napa------------	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, wetness.
70:				
McPaul----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
123:				
Grantcenter-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
133:				
Colo------------	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
133+:				
Colo------------	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
137:				
Haynie----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
144:				
Blake-----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
145:				
Onawa-----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
146:				
Onawa-----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.

Table 19.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
147:				
Modale	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer.
149:				
Modale	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
155:				
Albaton	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
156:				
Albaton	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
157:				
Albaton	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
212:				
Kennebec	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
212+:				
Kennebec	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
220:				
Nodaway	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
234:				
Nishna	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
237:				
Sarpy	Good	Probable	Improbable: too sandy.	Poor: too sandy.
237B:				
Sarpy	Good	Probable	Improbable: too sandy.	Poor: too sandy.
244:				
Blend	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer.
255:				
Cooper	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.

Table 19.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
257:				
Uturin	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
266:				
Smithland	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
275:				
Moville	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
366:				
Luton	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
430:				
Ackmore	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
436:				
Lakeport	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
446:				
Burcham	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
465:				
Tieville	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
510:				
Monona	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
510B:				
Monona	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
510C:				
Monona	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
510C2:				
Monona	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
510C3:				
Monona	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
514:				
Grable	Good	Probable	Improbable: too sandy.	Fair: thin layer.

Table 19.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
515:				
Percival	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too clayey.
516:				
Vore	Good	Probable	Improbable: too sandy.	Fair: too clayey, thin layer.
552:				
Owego	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
553:				
Forney	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
670:				
Rawles	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
717D:				
Napier	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Gullied land.				
746:				
Lossing	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
747:				
Rodney	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
748:				
Hornick	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
754:				
Larpenteur	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
945:				
Albaton	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
946:				
Albaton	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.

Table 19.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1137:				
Haynie	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
1144:				
Blake	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
1145:				
Onawa	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
1146:				
Onawa	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
1147:				
Modale	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer.
1150:				
Modale	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
1155:				
Albaton	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
1156:				
Albaton	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
1157:				
Albaton	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
1220:				
Nodaway	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
1237:				
Sarpy	Good	Probable	Improbable: too sandy.	Poor: too sandy.
1237B:				
Sarpy	Good	Probable	Improbable: too sandy.	Poor: too sandy.
1514:				
Grable	Good	Probable	Improbable: too sandy.	Fair: thin layer.
1515:				
Percival	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too clayey.

Table 19.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1516:				
Vore	Good	Probable	Improbable: too sandy.	Fair: too clayey, thin layer.
1524:				
Morconick	Good	Probable	Improbable: too sandy.	Poor: too sandy.
1525:				
Scroll	Fair: wetness.	Probable	Improbable: too sandy.	Fair: too sandy.
1526:				
Scroll	Fair: wetness.	Probable	Improbable: too sandy.	Fair: too sandy.
1552:				
Owego	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
1746:				
Lossing	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
1747:				
Rodney	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
1750:				
Ticonic	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
1849:				
Kenmoor	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
5010:				
Pits	Good	Probable	Probable	Poor: too sandy.
5040:				
Orthents	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
5044:				
Fluvaquents.				
5045:				
Aquents	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
5046:				
Aquents	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

Table 19.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
5047:				
Aquents	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
5051:				
Fluvaquents	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
5090:				
Aquents	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Orthents.				

Table 20.--Water Management

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1C:							
Ida	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
1C3:							
Ida	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
1D:							
Ida	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
1D3:							
Ida	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
1E:							
Ida	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
1E3:							
Ida	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
1F:							
Ida	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
1F3:							
Ida	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
1G:							
Ida	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
2G:							
Hamburg	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.

Table 20.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
3D: Castana	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
3E: Castana	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
3F: Castana	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
10B: Monona	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
10C: Monona	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
10C2: Monona	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
10C3: Monona	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
10D: Monona	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
10D2: Monona	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
10D3: Monona	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
10E: Monona	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.

Table 20.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
10E2:							
Monona----------	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope----------	Slope, erodes easily.	Slope, erodes easily.
10E3:							
Monona----------	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
10F:							
Monona----------	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope----------	Slope, erodes easily.	Slope, erodes easily.
10F2:							
Monona----------	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope----------	Slope, erodes easily.	Slope, erodes easily.
10F3:							
Monona----------	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
10G:							
Monona----------	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope----------	Slope, erodes easily.	Slope, erodes easily.
12B:							
Napier----------	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope----------	Erodes easily	Erodes easily.
12C:							
Napier----------	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope----------	Erodes easily	Erodes easily.
12D:							
Napier----------	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope----------	Slope, erodes easily.	Slope, erodes easily.
17B:							
Napier----------	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope----------	Erodes easily	Erodes easily.
Kennebec--------	Moderate: seepage.	Moderate: thin layer, piping, wetness.	Moderate: deep to water, slow refill.	Deep to water	Flooding-------	Favorable------	Favorable.

Table 20.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
17B:							
Colo	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness, flooding.	Wetness	Wetness.
33D:							
Steinauer	Severe: slope.	Moderate: piping, hard to pack.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
33E:							
Steinauer	Severe: slope.	Moderate: piping, hard to pack.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
33F:							
Steinauer	Severe: slope.	Moderate: piping, hard to pack.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
33G:							
Steinauer	Severe: slope.	Moderate: piping, hard to pack.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
36:							
Salix	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Favorable	Erodes easily	Erodes easily.
44:							
Blencoe	Moderate: seepage.	Severe: piping.	Severe: slow refill.	Percs slowly, frost action.	Wetness, slow intake, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
46:							
Keg	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable	Erodes easily	Erodes easily.
54:							
Zook	Slight	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
54+:							
Zook	Slight	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.

Table 20.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
66: Luton	Slight	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
66+: Luton	Slight	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
67: Woodbury	Moderate: seepage.	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness, slow intake, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
68: Napa	Slight	Severe: hard to pack, wetness, excess sodium.	Severe: no water.	Percs slowly, excess salt, excess sodium.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, excess sodium, erodes easily.
70: McPaul	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable	Favorable	Favorable.
123: Grantcenter	Severe: seepage.	Moderate: thin layer, piping, wetness.	Moderate: deep to water, slow refill.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.
133: Colo	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness, flooding.	Wetness	Wetness.
133+: Colo	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness, flooding.	Wetness	Wetness.
137: Haynie	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable	Erodes easily	Erodes easily.
144: Blake	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.

Table 20.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Limitations for-- Aquifer-fed excavated ponds	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
145:							
Onawa	Severe: seepage.	Severe: piping.	Severe: slow refill.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
146:							
Onawa	Severe: seepage.	Severe: piping.	Severe: slow refill.	Percs slowly, frost action.	Wetness, slow intake, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
147:							
Modale	Moderate: seepage.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
149:							
Modale	Moderate: seepage.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
155:							
Albaton	Slight	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
156:							
Albaton	Slight	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
157:							
Albaton	Slight	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
212:							
Kennebec	Moderate: seepage.	Moderate: thin layer, piping, wetness.	Moderate: deep to water, slow refill.	Deep to water	Flooding	Favorable	Favorable.
212+:							
Kennebec	Moderate: seepage.	Moderate: thin layer, piping, wetness.	Moderate: deep to water, slow refill.	Deep to water	Flooding	Favorable	Favorable.

Table 20.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
220:							
Nodaway	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Flooding	Erodes easily	Erodes easily.
234:							
Nishna	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly, flooding.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
237:							
Sarpy	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake.	Too sandy, soil blowing.	Droughty.
237B:							
Sarpy	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
244:							
Blend	Moderate: seepage.	Severe: hard to pack.	Severe: slow refill.	Deep to water	Slow intake, percs slowly.	Percs slowly	Percs slowly.
255:							
Cooper	Moderate: seepage.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly.	Wetness, percs slowly.	Percs slowly.
257:							
Uturin	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly, flooding.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
266:							
Smithland	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness, flooding.	Wetness	Wetness.
275:							
Moville	Moderate: seepage.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Erodes easily, percs slowly.
366:							
Luton	Slight	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.

Table 20.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
430:							
Ackmore	Moderate: seepage.	Moderate: hard to pack, wetness.	Moderate: deep to water, slow refill.	Flooding, frost action.	Wetness, flooding.	Wetness	Favorable.
436:							
Lakeport	Moderate: seepage.	Moderate: hard to pack, wetness.	Severe: slow refill.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.
446:							
Burcham	Moderate: seepage.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly.	Wetness, percs slowly.	Percs slowly.
465:							
Tieville	Slight	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, flooding.	Wetness, droughty, slow intake.	Wetness, percs slowly.	Wetness, droughty, percs slowly.
510:							
Monona	Moderate: seepage.	Moderate: piping.	Severe: no water.	Deep to water	Favorable	Erodes easily	Erodes easily.
510B:							
Monona	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
510C:							
Monona	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
510C2:							
Monona	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
510C3:							
Monona	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
514:							
Grable	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Favorable	Erodes easily, too sandy.	Erodes easily.

Table 20.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
515:							
Percival	Severe: seepage.	Severe: seepage, piping.	Severe: slow refill, cutbanks cave.	Percs slowly, cutbanks cave.	Wetness, droughty, slow intake.	Wetness, too sandy.	Droughty, percs slowly.
516:							
Vore	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Deep to water	Favorable	Too sandy	Favorable.
552:							
Owego	Moderate: seepage.	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly	Wetness, slow intake, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
553:							
Forney	Slight	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
670:							
Rawles	Moderate: seepage.	Moderate: piping, wetness.	Moderate: deep to water, slow refill.	Deep to water	Flooding	Favorable	Favorable.
717D:							
Napier	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Gullied land.							
746:							
Lossing	Severe: seepage.	Severe: piping.	Severe: slow refill.	Percs slowly, frost action.	Wetness, slow intake, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
747:							
Rodney	Severe: seepage.	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness, slow intake, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
748:							
Hornick	Moderate: seepage.	Severe: hard to pack.	Severe: slow refill.	Percs slowly, frost action.	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Percs slowly.

Table 20.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
754:							
Larpenteur------	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Frost action---	Wetness--------	Erodes easily, wetness.	Erodes easily.
945:							
Albaton---------	Slight---------	Severe: hard to pack, ponding.	Severe: slow refill.	Ponding, percs slowly, flooding.	Ponding, slow intake, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.
946:							
Albaton---------	Slight---------	Severe: hard to pack, ponding.	Severe: slow refill.	Ponding, percs slowly, flooding.	Ponding, slow intake, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.
1137:							
Haynie----------	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable------	Erodes easily	Erodes easily.
1144:							
Blake-----------	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Erodes easily.
1145:							
Onawa-----------	Severe: seepage.	Severe: piping.	Severe: slow refill.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
1146:							
Onawa-----------	Severe: seepage.	Severe: piping.	Severe: slow refill.	Percs slowly, flooding, frost action.	Wetness, slow intake, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
1147:							
Modale----------	Moderate: seepage.	Severe: hard to pack.	Severe: no water.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
1150:							
Modale----------	Moderate: seepage.	Severe: hard to pack.	Severe: no water.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
1155:							
Albaton---------	Slight---------	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, flooding.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.

Table 20.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1156:							
Albaton	Slight	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, flooding.	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
1157:							
Albaton	Slight	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, flooding.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
1220:							
Nodaway	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Flooding	Erodes easily	Erodes easily.
1237:							
Sarpy	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake.	Too sandy, soil blowing.	Droughty.
1237B:							
Sarpy	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
1514:							
Grable	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Favorable	Erodes easily, too sandy.	Erodes easily.
1515:							
Percival	Severe: seepage.	Severe: seepage, piping.	Severe: slow refill, cutbanks cave.	Percs slowly, flooding, cutbanks cave.	Wetness, droughty, slow intake.	Wetness, too sandy.	Droughty, percs slowly.
1516:							
Vore	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Deep to water	Flooding	Too sandy	Favorable.
1524:							
Morconick	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, flooding.	Erodes easily, too sandy.	Erodes easily, droughty.

Table 20.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1525:							
Scroll----------	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Percs slowly, flooding, cutbanks cave.	Wetness, droughty, slow intake.	Wetness--------	Droughty.
1526:							
Scroll----------	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Flooding, cutbanks cave.	Wetness, droughty.	Erodes easily, wetness.	Erodes easily, droughty.
1552:							
Owego-----------	Moderate: seepage.	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, flooding.	Wetness, slow intake, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
1746:							
Lossing---------	Severe: seepage.	Severe: piping.	Severe: slow refill.	Percs slowly, flooding, frost action.	Wetness, slow intake, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
1747:							
Rodney----------	Severe: seepage.	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, flooding, frost action.	Wetness, slow intake, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
1750:							
Ticonic---------	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Soil blowing---	Droughty.
1849:							
Kenmoor---------	Severe: seepage.	Severe: hard to pack.	Severe: no water.	Percs slowly, flooding.	Wetness, droughty.	Wetness, soil blowing, percs slowly.	Droughty, percs slowly.
5010:							
Pits------------	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake.	Too sandy------	Droughty.
5040:							
Orthents--------	Moderate: seepage.	Slight---------	Severe: no water.	Deep to water	Droughty-------	Soil blowing---	Droughty.
5044:							
Fluvaquents.							

Table 20.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
5045:							
Aquents	Slight	Severe: ponding.	Slight	Ponding	Ponding	Ponding	Wetness.
5046:							
Aquents	Slight	Severe: wetness.	Slight	Favorable	Wetness	Wetness	Wetness.
5047:							
Aquents	Slight	Severe: wetness.	Slight	Flooding	Wetness, flooding.	Wetness	Wetness.
5051:							
Fluvaquents	Severe: seepage.	Severe: ponding.	Severe: slow refill.	Ponding, flooding.	Ponding, rooting depth.	Ponding	Wetness, rooting depth.
5090:							
Aquents	Slight	Severe: ponding.	Slight	Ponding	Ponding	Ponding	Wetness.
Orthents.							

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 21 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given in the series descriptions in Part I of this survey.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 16). “Loam,” for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, “gravelly.” Textural terms are defined in the Glossary.

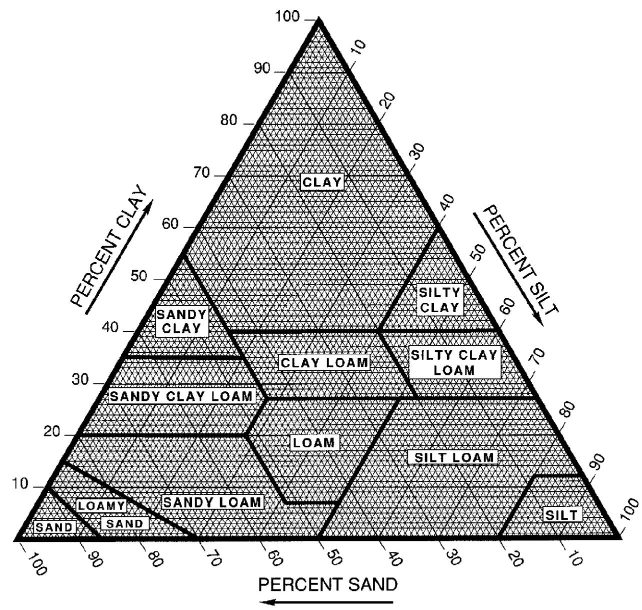

Figure 16.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2001) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2000).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and

maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and ***plasticity index*** (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical Properties

Table 22 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given in the series descriptions in Part I of this survey.

Clay as a soil separate, or component, consists of mineral soil particles that are less than 0.002 millimeter in diameter. The estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $^{1}/_{3}$-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In the table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of

irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are ***low***, a change of less than 3 percent; ***moderate***, 3 to 6 percent; and ***high***, 6 to 9 percent. ***Very high***, more than 9 percent, is sometimes used.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In the table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, very fine sand, sand, and organic matter (as much as 4 percent) and on soil structure and permeability. The estimates are modified by the presence of rock fragments. Values of K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils generally are not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams that have more than 5 percent finely divided calcium carbonate. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils have less than 5 percent finely divided calcium carbonate. They are moderately erodible. Crops can be grown if measures to control wind erosion are used.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils have less than 5 percent finely divided calcium carbonate. They are moderately erodible. Crops can be grown if ordinary measures to control wind erosion are used.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils have less than 5 percent finely divided calcium carbonate. They are very slightly erodible. Crops can be grown if ordinary measures to control wind erosion are used.

8. Soils that are not subject to wind erosion because of rock fragments on the surface or because of surface wetness.

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be

lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Chemical Properties of the Soils

Table 23 shows estimates of some chemical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Clay as a soil separate, or component, consists of mineral soil particles that are less than 0.002 millimeter in diameter. The estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Cation-exchange capacity is the total amount of extractable bases that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. The ability to retain cations reduces the hazard of ground-water pollution.

Soil reaction is a measure of acidity or alkalinity. The pH of each soil horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients is influenced by the amount of carbonates in the soil. Incorporating nitrogen fertilizer into calcareous soils helps to prevent nitrite accumulation and ammonium-N volatilization.

Gypsum is expressed as a percent, by weight, of hydrated calcium sulfates in the fraction of the soil less than 20 millimeters in size. Gypsum is partially soluble in water. Soils that have a high content of gypsum may collapse if the gypsum is removed by percolating water.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Sodium adsorption ratio (SAR) is a measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration. Soils that have SAR values of 13 or more may be characterized by an increased dispersion of organic matter and clay particles, reduced permeability and aeration, and a general degradation of soil structure.

Water Features

Table 24 gives estimates of several important water features used in land use planning that involves engineering considerations. These features are described in the following paragraphs.

Hydrologic soil groups are groups of soils that, when saturated, have the same runoff potential under similar storm and ground cover conditions. The soil properties that affect the runoff potential are those that influence the minimum rate of infiltration in a bare soil after prolonged wetting and when the soil is not frozen. These properties include the depth to a seasonal high water table, the infiltration rate, permeability after prolonged wetting, and the depth to a very slowly permeable layer. The influences of ground cover and slope are treated independently and are not taken into account in hydrologic soil groups.

In the definitions of the hydrologic soil groups, the infiltration rate is the rate at which water enters the soil at the surface and is controlled by surface conditions. The transmission rate is the rate at which water moves through the soil and is controlled by properties of the soil layers.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of very deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have a moderately fine to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils that have a moderately fine or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clayey soils that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary covering of the soil surface by flowing water, is caused by overflow from streams or by runoff from adjacent slopes. Shallow water standing or flowing for short periods after rainfall or snowmelt is not considered flooding. Standing water in marshes and swamps or in closed depressions is considered to be ponding.

Table 24 gives the frequency and duration of flooding and the time of year when flooding is most likely to occur. Frequency, duration, and probable dates of occurrence are estimated. Frequency generally is expressed as none, rare, occasional, or frequent. ***None*** means that flooding is not probable; ***rare*** that it is unlikely but is possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); ***occasional*** that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); and ***frequent*** that it occurs often under normal weather conditions (the chance of flooding is 50 percent in any year). Duration is expressed as ***very brief*** (less than 2 days), ***brief*** (2 to 7 days), ***long*** (7 to 30 days), and ***very long*** (more than 30 days). The time of year that flooding is most likely to occur is expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information on flooding is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and level of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is a zone of saturation at the highest average depth during the wettest season. It is at least 6 inches thick, persists in the soil for more than a few weeks, and is within 6 feet of the surface. Indicated in the table are the depth to the seasonal high water table, the kind of water table, and the months of the year when the water table usually is highest.

An ***apparent*** water table is indicated by the level at which water stands in a freshly dug, unlined borehole after adequate time for adjustments in the surrounding soil.

A ***perched*** water table is one that is above an unsaturated zone in the soil. The basis for determining that a water table is perched may be general knowledge of the area. The water table is proven to be perched if the water level in a borehole is observed to fall when the borehole is extended.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. “More than 6.0” indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. Duration is expressed as ***very brief*** if less than 2 days, ***brief*** if 2 to 7 days, ***long*** if 7 to 30 days, and ***very long*** if more than 30 days. ***Maximum ponding depth*** refers to the depth of the water above the surface of the soil.

Soil Features

Table 25 gives estimates of several important soil features used in land use planning that involves engineering considerations. These features are described in the following paragraphs.

Depth to bedrock is given if bedrock is within a depth of 60 inches. The depth is based on many soil

borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

A ***low*** potential for frost action indicates that the soil is rarely susceptible to the formation of ice lenses; a ***moderate*** potential indicates that the soil is susceptible to formation of ice lenses, resulting in frost heave and the subsequent loss of soil strength; and a ***high*** potential indicates that the soil is highly susceptible to formation of ice lenses, resulting in frost heave and the subsequent loss of soil strength.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate content, texture, moisture content, and acidity of the soil.

Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as ***low, moderate,*** or ***high***, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as ***low, moderate,*** or ***high***. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Table 21.--Engineering Index Properties

(Absence of an entry indicates that data were not estimated)

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
1C:												
Ida-------------	0-8	Silt loam------	ML, CL	A-4, A-6	0	0	100	100	95-100	95-100	30-40	5-15
	8-60	Silt loam------	ML, CL	A-4, A-6	0	0	100	100	95-100	95-100	30-40	5-15
1C3:												
Ida-------------	0-8	Silt loam------	ML, CL	A-4, A-6	0	0	100	100	95-100	95-100	30-40	5-15
	8-60	Silt loam------	ML, CL	A-4, A-6	0	0	100	100	95-100	95-100	30-40	5-15
1D:												
Ida-------------	0-8	Silt loam------	ML, CL	A-4, A-6	0	0	100	100	95-100	95-100	30-40	5-15
	8-60	Silt loam------	ML, CL	A-4, A-6	0	0	100	100	95-100	95-100	30-40	5-15
1D3:												
Ida-------------	0-8	Silt loam------	ML, CL	A-4, A-6	0	0	100	100	95-100	95-100	30-40	5-15
	8-60	Silt loam------	ML, CL	A-4, A-6	0	0	100	100	95-100	95-100	30-40	5-15
1E:												
Ida-------------	0-8	Silt loam------	ML, CL	A-4, A-6	0	0	100	100	95-100	95-100	30-40	5-15
	8-60	Silt loam------	ML, CL	A-4, A-6	0	0	100	100	95-100	95-100	30-40	5-15
1E3:												
Ida-------------	0-8	Silt loam------	ML, CL	A-4, A-6	0	0	100	100	95-100	95-100	30-40	5-15
	8-60	Silt loam------	ML, CL	A-4, A-6	0	0	100	100	95-100	95-100	30-40	5-15
1F:												
Ida-------------	0-8	Silt loam------	ML, CL	A-4, A-6	0	0	100	100	95-100	95-100	30-40	5-15
	8-60	Silt loam------	ML, CL	A-4, A-6	0	0	100	100	95-100	95-100	30-40	5-15
1F3:												
Ida-------------	0-8	Silt loam------	ML, CL	A-4, A-6	0	0	100	100	95-100	95-100	30-40	5-15
	8-60	Silt loam------	ML, CL	A-4, A-6	0	0	100	100	95-100	95-100	30-40	5-15
1G:												
Ida-------------	0-8	Silt loam------	ML, CL	A-4, A-6	0	0	100	100	95-100	95-100	30-40	5-15
	8-60	Silt loam------	ML, CL	A-4, A-6	0	0	100	100	95-100	95-100	30-40	5-15
2G:												
Hamburg---------	0-4	Silt loam------	CL-ML, ML	A-4	0	0	100	100	100	95-100	0-25	NP-5
	4-60	Silt loam, very fine sandy loam, silt.	CL-ML, ML	A-4	0	0	100	100	100	95-100	0-25	NP-5

Table 21.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >10 inches	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
3D:												
Castana---------	0-18	Silt loam------	CL	A-4, A-6	0	0	100	100	95-100	95-100	25-40	8-20
	18-60	Silt loam------	CL	A-4, A-6	0	0	100	100	95-100	95-100	25-40	8-20
3E:												
Castana---------	0-14	Silt loam------	CL	A-4, A-6	0	0	100	100	95-100	95-100	25-40	8-20
	14-60	Silt loam------	CL	A-4, A-6	0	0	100	100	95-100	95-100	25-40	8-20
3F:												
Castana---------	0-14	Silt loam------	CL	A-4, A-6	0	0	100	100	95-100	95-100	25-40	8-20
	14-60	Silt loam------	CL	A-4, A-6	0	0	100	100	95-100	95-100	25-40	8-20
10B:												
Monona----------	0-14	Silt loam------	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	14-54	Silt loam, silty clay loam.	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	54-60	Silt loam------	CL	A-6	0	0	100	100	95-100	95-100	30-40	10-20
10C:												
Monona----------	0-14	Silt loam------	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	14-54	Silt loam, silty clay loam.	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	54-60	Silt loam------	CL	A-6	0	0	100	100	95-100	95-100	30-40	10-20
10C2:												
Monona----------	0-8	Silt loam------	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	8-30	Silt loam, silty clay loam.	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	30-60	Silt loam------	CL	A-6	0	0	100	100	95-100	95-100	30-40	10-20
10C3:												
Monona----------	0-8	Silt loam------	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	8-30	Silt loam, silty clay loam.	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	30-60	Silt loam------	CL	A-6	0	0	100	100	95-100	95-100	30-40	10-20
10D:												
Monona----------	0-14	Silt loam------	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	14-54	Silt loam, silty clay loam.	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	54-60	Silt loam------	CL	A-6	0	0	100	100	95-100	95-100	30-40	10-20

Table 21.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
10D2:												
Monona----------	0-8	Silt loam------	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	8-30	Silt loam, silty clay loam.	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	30-60	Silt loam------	CL	A-6	0	0	100	100	95-100	95-100	30-40	10-20
10D3:												
Monona----------	0-8	Silt loam------	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	8-30	Silt loam, silty clay loam.	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	30-60	Silt loam------	CL	A-6	0	0	100	100	95-100	95-100	30-40	10-20
10E:												
Monona----------	0-14	Silt loam------	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	14-54	Silt loam, silty clay loam.	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	54-60	Silt loam------	CL	A-6	0	0	100	100	95-100	95-100	30-40	10-20
10E2:												
Monona----------	0-8	Silt loam------	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	8-30	Silt loam, silty clay loam.	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	30-60	Silt loam------	CL	A-6	0	0	100	100	95-100	95-100	30-40	10-20
10E3:												
Monona----------	0-8	Silt loam------	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	8-30	Silt loam, silty clay loam.	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	30-60	Silt loam------	CL	A-6	0	0	100	100	95-100	95-100	30-40	10-20
10F:												
Monona----------	0-14	Silt loam------	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	14-54	Silt loam, silty clay loam.	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	54-60	Silt loam------	CL	A-6	0	0	100	100	95-100	95-100	30-40	10-20

Table 21.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct	Pct					Pct	
10F2:												
Monona----------	0-8	Silt loam------	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	8-30	Silt loam, silty clay loam.	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	30-60	Silt loam------	CL	A-6	0	0	100	100	95-100	95-100	30-40	10-20
10F3:												
Monona----------	0-8	Silt loam------	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	8-30	Silt loam, silty clay loam.	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	30-60	Silt loam------	CL	A-6	0	0	100	100	95-100	95-100	30-40	10-20
10G:												
Monona----------	0-14	Silt loam------	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	14-54	Silt loam, silty clay loam.	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	54-60	Silt loam------	CL	A-6	0	0	100	100	95-100	95-100	30-40	10-20
12B:												
Napier----------	0-28	Silt loam------	CL	A-4, A-6	0	0	100	100	95-100	95-100	25-40	8-20
	28-60	Silt loam------	CL	A-4, A-6	0	0	100	100	95-100	95-100	25-40	8-20
12C:												
Napier----------	0-28	Silt loam------	CL	A-4, A-6	0	0	100	100	95-100	95-100	25-40	8-20
	28-60	Silt loam------	CL	A-4, A-6	0	0	100	100	95-100	95-100	25-40	8-20
12D:												
Napier----------	0-28	Silt loam------	CL	A-4, A-6	0	0	100	100	95-100	95-100	25-40	8-20
	28-60	Silt loam------	CL	A-4, A-6	0	0	100	100	95-100	95-100	25-40	8-20
17B:												
Napier----------	0-28	Silt loam------	CL	A-4, A-6	0	0	100	100	95-100	95-100	25-40	8-20
	28-60	Silt loam------	CL	A-4, A-6	0	0	100	100	95-100	95-100	25-40	8-20
Kennebec--------	0-48	Silt loam------	CL	A-6, A-7	0	0	100	100	95-100	90-100	25-45	10-20
	48-60	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	0	100	100	95-100	90-100	25-40	5-15
Colo------------	0-16	Silty clay loam	CL, CH	A-7	0	0	100	100	90-100	90-100	40-60	15-30
	16-40	Silty clay loam	CL, CH	A-7	0	0	100	100	90-100	90-100	40-55	20-30
	40-60	Silty clay loam, clay loam, silt loam.	CL, CH	A-7	0	0	100	100	95-100	80-100	40-55	15-30

Table 21.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
33D:												
Steinauer-------	0-6	Clay loam------	CL	A-6, A-7	0	0-5	95-100	95-100	85-100	55-90	30-50	15-25
	6-12	Clay loam------	CL, CH	A-6, A-7	0	0-5	95-100	95-100	90-100	70-90	30-55	12-30
	12-60	Loam, clay loam	CL, CH	A-6, A-7	0	0-5	95-100	95-100	90-100	60-75	25-55	10-30
33E:												
Steinauer-------	0-6	Clay loam------	CL	A-6, A-7	0	0-5	95-100	95-100	85-100	55-90	30-50	15-25
	6-12	Clay loam------	CL, CH	A-6, A-7	0	0-5	95-100	95-100	90-100	70-90	30-55	12-30
	12-60	Loam, clay loam	CL, CH	A-6, A-7	0	0-5	95-100	95-100	90-100	60-75	25-55	10-30
33F:												
Steinauer-------	0-6	Clay loam------	CL	A-6, A-7	0	0-5	95-100	95-100	85-100	55-90	30-50	15-25
	6-12	Clay loam------	CL, CH	A-6, A-7	0	0-5	95-100	95-100	90-100	70-90	30-55	12-30
	12-60	Loam, clay loam	CL, CH	A-6, A-7	0	0-5	95-100	95-100	90-100	60-75	25-55	10-30
33G:												
Steinauer-------	0-6	Clay loam------	CL	A-6, A-7	0	0-5	95-100	95-100	85-100	55-90	30-50	15-25
	6-12	Clay loam------	CL, CH	A-6, A-7	0	0-5	95-100	95-100	90-100	70-90	30-55	12-30
	12-60	Loam, clay loam	CL, CH	A-6, A-7	0	0-5	95-100	95-100	90-100	60-75	25-55	10-30
36:												
Salix-----------	0-17	Silty clay loam	CL, CH	A-7	0	0	100	100	95-100	95-100	40-60	20-35
	17-23	Silty clay loam	CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	20-30
	23-60	Silt loam, loam, very fine sandy loam.	CL, ML	A-4, A-6	0	0	100	100	95-100	90-100	30-40	5-15
44:												
Blencoe---------	0-27	Silty clay-----	CH	A-7	0	0	100	100	95-100	95-100	60-85	30-50
	27-33	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	95-100	90-100	41-60	20-30
	33-60	Silt loam------	ML, CL	A-4, A-6	0	0	100	100	95-100	85-100	30-40	5-15
46:												
Keg-------------	0-17	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	90-100	25-35	5-15
	17-60	Silt loam, very fine sandy loam.	CL, CL-ML	A-4, A-6	0	0	100	100	90-100	80-100	25-35	5-15

Table 21.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
54:												
Zook------------	0-30	Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	95-100	45-65	20-35
	30-40	Silty clay, silty clay loam.	CH	A-7	0	0	100	100	95-100	95-100	60-85	35-55
	40-60	Silty clay loam, silty clay, silt loam.	CH, CL, ML, MH	A-7, A-6	0	0	100	100	95-100	95-100	35-80	10-50
54+:												
Zook------------	0-15	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	95-100	25-40	5-15
	15-45	Silty clay, silty clay loam.	CH	A-7	0	0	100	100	95-100	95-100	60-85	35-55
	45-60	Silty clay loam, silty clay, silt loam.	CH, CL, ML, MH	A-7, A-6	0	0	100	100	95-100	95-100	35-80	10-50
66:												
Luton-----------	0-14	Silty clay-----	CH	A-7	0	0	100	100	95-100	95-100	60-85	35-60
	14-30	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	95-100	60-85	35-60
	30-60	Silty clay-----	CH	A-7	0	0	100	100	95-100	95-100	60-85	35-60
66+:												
Luton-----------	0-9	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	90-100	25-40	5-15
	9-22	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	95-100	60-85	35-60
	22-80	Silty clay-----	CH	A-7	0	0	100	100	95-100	95-100	60-85	35-60
67:												
Woodbury--------	0-24	Silty clay-----	CH	A-7	0	0	100	100	100	95-100	60-85	35-60
	24-36	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	90-100	60-85	35-60
	36-60	Silty clay loam	CH, CL	A-7	0	0	100	100	90-100	80-100	40-60	20-35
68:												
Napa------------	0-1	Silty clay loam	CL, ML	A-6, A-7	0	0	100	100	100	90-100	35-50	12-20
	1-30	Silty clay, clay.	CH, MH	A-7	0	0	100	100	95-100	90-100	50-80	20-45
	30-60	Silty clay, clay, silty clay loam.	CL, CH, MH, ML	A-7	0	0	100	100	95-100	90-100	40-75	15-40

Table 21.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
70:												
McPaul----------	0-60	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	90-100	25-40	5-15
123:												
Grantcenter-----	0-23	Silty clay loam	CL, ML	A-7, A-6	0	0	100	100	85-100	85-100	35-50	10-25
	23-56	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	0	100	100	85-100	85-100	35-50	10-25
	56-60	Silt loam, loam	CL, CL-ML	A-4, A-6, A-5, A-7	0	0	100	100	85-100	80-100	25-45	5-20
133:												
Colo------------	0-16	Silty clay loam	CL, CH	A-7	0	0	100	100	90-100	90-100	40-60	15-30
	16-40	Silty clay loam	CL, CH	A-7	0	0	100	100	90-100	90-100	40-55	20-30
	40-60	Silty clay loam, clay loam, silt loam.	CL, CH	A-7	0	0	100	100	95-100	80-100	40-55	15-30
133+:												
Colo------------	0-16	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	95-100	25-40	5-15
	16-40	Silty clay loam	CL, CH	A-7	0	0	100	100	90-100	90-100	40-55	20-30
	40-60	Silty clay loam, clay loam, silt loam.	CL, CH	A-7	0	0	100	100	95-100	80-100	40-55	15-30
137:												
Haynie----------	0-7	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	100	85-100	70-100	25-40	5-15
	7-60	Silt loam, very fine sandy loam.	CL-ML, CL	A-4, A-6	0	0	100	100	85-100	85-100	25-35	5-15
144:												
Blake-----------	0-7	Silty clay loam	CL	A-7, A-6	0	0	100	100	90-100	85-95	35-50	15-30
	7-26	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	90-100	85-95	30-50	10-30
	26-60	Silt loam, loam, very fine sandy loam.	ML, CL	A-4, A-6	0	0	100	100	80-90	75-90	30-40	5-15

Table 21.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
145:												
Onawa-----------	0-7	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	80-100	25-40	5-20
	7-23	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	95-100	60-85	40-60
	23-60	Silt loam, very fine sandy loam, loam.	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	85-100	25-40	5-20
146:												
Onawa-----------	0-7	Silty clay-----	CH	A-7	0	0	100	100	95-100	95-100	60-85	40-60
	7-23	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	95-100	60-85	40-60
	23-60	Silt loam, very fine sandy loam, loam.	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	85-100	25-40	5-20
147:												
Modale----------	0-24	Silty clay loam	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	80-90	25-40	5-15
	24-60	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	95-100	65-85	40-60
149:												
Modale----------	0-24	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	80-90	25-40	5-15
	24-60	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	95-100	65-85	40-60
155:												
Albaton---------	0-15	Silty clay loam	CL, CH	A-7	0	0	100	100	95-100	90-100	40-60	20-35
	15-60	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	95-100	60-85	40-60
156:												
Albaton---------	0-15	Silty clay-----	CH	A-7	0	0	100	100	95-100	95-100	60-85	40-60
	15-60	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	95-100	60-85	40-60
157:												
Albaton---------	0-15	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	90-100	25-40	5-15
	15-60	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	95-100	60-85	40-60
212:												
Kennebec--------	0-48	Silt loam------	CL	A-6, A-7	0	0	100	100	95-100	90-100	25-45	10-20
	48-60	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	0	100	100	95-100	90-100	25-40	5-15

Table 21.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
212+:												
Kennebec--------	0-18	Silt loam------	CL	A-6, A-7	0	0	100	100	95-100	90-100	25-45	10-20
	18-60	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	0	100	100	95-100	90-100	25-40	5-15
220:												
Nodaway---------	0-8	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	90-100	25-35	5-15
	8-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	90-100	25-40	5-15
234:												
Nishna----------	0-30	Silty clay loam	CH, MH	A-7	0	0	100	100	95-100	90-100	55-65	25-35
	30-60	Silty clay, silty clay loam.	CH	A-7	0	0	100	100	95-100	90-100	60-70	30-40
237:												
Sarpy-----------	0-6	Loamy fine sand	SM	A-2-4	0	0	100	100	60-80	15-35	---	NP
	6-60	Fine sand, loamy fine sand, sand.	SM, SP, SP-SM	A-2-4, A-3	0	0	100	100	60-80	2-35	---	NP
237B:												
Sarpy-----------	0-6	Loamy fine sand	SM	A-2-4	0	0	100	100	60-80	15-35	---	NP
	6-60	Fine sand, loamy fine sand, sand.	SM, SP, SP-SM	A-2-4, A-3	0	0	100	100	60-80	2-35	---	NP
244:												
Blend-----------	0-20	Silty clay-----	CH	A-7	0	0	100	100	95-100	95-100	60-85	30-50
	20-31	Silty clay loam	CL	A-7	0	0	100	100	95-100	85-100	40-50	15-25
	31-60	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	95-100	60-85	30-55
255:												
Cooper----------	0-12	Silty clay loam	CL	A-7	0	0	100	100	95-100	85-100	40-50	20-30
	12-25	Silty clay loam	CL	A-7	0	0	100	100	95-100	95-100	40-50	20-30
	25-60	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	95-100	60-85	35-50
257:												
Uturin----------	0-25	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	90-100	25-35	5-15
	25-80	Silty clay, silty clay loam.	CH	A-7	0	0	100	100	95-100	90-100	60-70	30-40

Table 21.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
266:												
Smithland-------	0-16	Silty clay loam	CL, CH	A-7	0	0	100	100	90-100	90-100	40-60	15-30
	16-40	Silty clay loam	CL, CH	A-7	0	0	100	100	90-100	90-100	40-55	20-30
	40-60	Silty clay loam, clay loam, silt loam.	CL, CH	A-7	0	0	100	100	95-100	80-100	40-55	15-30
275:												
Moville---------	0-29	Silt loam------	CL	A-4, A-6	0	0	100	100	95-100	90-100	30-40	8-18
	29-60	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	95-100	65-85	40-60
366:												
Luton-----------	0-14	Silty clay loam	CL, CH	A-7	0	0	100	100	95-100	95-100	40-60	15-30
	14-25	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	95-100	60-85	35-60
	25-60	Silty clay-----	CH	A-7	0	0	100	100	95-100	95-100	60-85	35-60
430:												
Ackmore---------	0-10	Silt loam------	CL, ML	A-4, A-6, A-7	0	0	100	100	95-100	85-100	25-50	8-20
	10-23	Silt loam, silty clay loam.	CL, ML	A-4, A-6, A-7	0	0	100	100	95-100	85-100	25-50	8-20
	23-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	95-100	85-100	35-60	15-30
436:												
Lakeport--------	0-10	Silty clay loam	CL, CH	A-7	0	0	100	100	95-100	90-100	40-60	20-35
	10-26	Silty clay loam	CL, CH	A-7	0	0	100	100	95-100	90-100	40-60	20-35
	26-47	Silty clay, silty clay loam.	CL, CH	A-7	0	0	100	100	95-100	90-100	40-60	20-35
	47-60	Silt loam, loam, clay loam.	CL	A-6	0	0	100	100	90-100	85-95	25-40	10-20
446:												
Burcham---------	0-25	Silt loam------	CL, ML, CL-ML	A-4, A-6	0	0	100	100	95-100	90-100	25-35	5-15
	25-60	Silty clay, clay.	CH	A-7	0	0	100	100	100	95-100	60-80	45-60
465:												
Tieville--------	0-22	Silty clay-----	CH	A-7	0	0	100	100	90-100	75-95	55-70	35-45
	22-60	Silty clay, clay.	CH	A-7	0	0	100	100	90-100	75-95	55-70	35-45

Table 21.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
510:												
Monona----------	0-14	Silt loam------	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	14-54	Silt loam, silty clay loam.	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	54-60	Silt loam------	CL	A-6	0	0	100	100	95-100	95-100	30-40	10-20
510B:												
Monona----------	0-14	Silt loam------	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	14-54	Silt loam, silty clay loam.	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	54-60	Silt loam------	CL	A-6	0	0	100	100	95-100	95-100	30-40	10-20
510C:												
Monona----------	0-14	Silt loam------	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	14-54	Silt loam, silty clay loam.	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	54-60	Silt loam------	CL	A-6	0	0	100	100	95-100	95-100	30-40	10-20
510C2:												
Monona----------	0-8	Silt loam------	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	8-30	Silt loam, silty clay loam.	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	30-60	Silt loam------	CL	A-6	0	0	100	100	95-100	95-100	30-40	10-20
510C3:												
Monona----------	0-8	Silt loam------	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	8-30	Silt loam, silty clay loam.	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-25
	30-60	Silt loam------	CL	A-6	0	0	100	100	95-100	95-100	30-40	10-20
514:												
Grable----------	0-10	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	80-95	80-95	25-40	5-20
	10-23	Silt loam, very fine sandy loam.	CL, CL-ML	A-4, A-6	0	0	100	100	80-95	80-95	0-25	5-15
	23-60	Fine sand, loamy sand, sand.	SM, SC-SM, SP-SM	A-2, A-3	0	0	100	100	65-80	5-35	0-20	NP-5

Table 21.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
515:												
Percival--------	0-6	Silty clay-----	CH	A-7	0	0	100	100	95-100	95-100	60-85	35-60
	6-23	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	95-100	60-85	35-60
	23-60	Stratified fine sand to loamy fine sand.	SM, SC-SM, SP-SM	A-2	0	0	100	100	80-95	12-30	0-20	NP-5
516:												
Vore------------	0-24	Silty clay loam	CL	A-7, A-6	0	0	100	100	95-100	90-100	35-50	15-25
	24-60	Fine sand, loamy fine sand.	SW-SM, SP-SM, SM, SC-SM	A-3, A-2-4	0	0	100	100	80-90	5-20	0-20	NP-5
552:												
Owego-----------	0-17	Silty clay-----	CH	A-7	0	0	100	100	95-100	95-100	60-85	30-55
	17-25	Silt loam, silty clay loam, clay loam.	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	90-100	25-40	5-15
	25-60	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	95-100	60-85	30-55
553:												
Forney----------	0-15	Silty clay-----	CH	A-7	0	0	100	100	95-100	95-100	60-85	35-55
	15-60	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	95-100	60-85	35-55
670:												
Rawles----------	0-28	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	100	90-100	25-40	5-15
	28-60	Silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	100	90-100	30-45	10-20
717D:												
Napier----------	0-28	Silt loam------	CL	A-4, A-6	0	0	100	100	95-100	95-100	25-40	8-20
	28-60	Silt loam------	CL	A-4, A-6	0	0	100	100	95-100	95-100	25-40	8-20
Gullied land.												
746:												
Lossing---------	0-6	Silty clay-----	CH	A-7	0	0	100	100	95-100	95-100	60-85	30-55
	6-10	Silty clay-----	CH	A-7	0	0	100	100	95-100	95-100	60-85	30-55
	10-14	Silty clay loam	CL	A-7, A-6	0	0	100	100	99-100	95-100	35-50	15-30
	14-71	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	80-100	25-40	5-20
	71-80	Fine sandy loam	SM	A-2-4	0	0	100	100	56-80	30-45	0-20	NP-5

Table 21.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
747:												
Rodney----------	0-9	Silty clay-----	CH	A-7	0	0	100	100	95-100	95-100	60-85	30-55
	9-28	Silt loam, loam	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	80-100	25-40	5-20
	28-60	Silty clay-----	CH	A-7	0	0	100	100	95-100	95-100	60-85	30-55
748:												
Hornick---------	0-9	Silty clay-----	CH	A-7	0	0	100	100	95-100	95-100	60-85	30-55
	9-19	Silt loam------	CL, ML	A-4, A-6	0	0	100	100	95-100	80-95	25-45	10-20
	19-30	Silt loam------	CL, ML	A-4, A-6	0	0	100	100	90-100	80-95	25-45	10-20
	30-80	Silty clay-----	CH	A-7	0	0	100	100	95-100	90-100	60-85	30-55
754:												
Larpenteur------	0-14	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	90-100	25-35	5-15
	14-20	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	70-100	25-35	5-15
	20-36	Loam, silt loam	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	65-100	25-35	5-15
	36-60	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	65-100	25-35	5-15
945:												
Albaton---------	0-60	Silty clay-----	CH	A-7	0	0	100	100	95-100	95-100	60-85	40-60
946:												
Albaton---------	0-60	Silty clay-----	CH	A-7	0	0	100	100	95-100	95-100	60-85	40-60
1137:												
Haynie----------	0-7	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	100	85-100	70-100	25-40	5-15
	7-60	Silt loam, very fine sandy loam.	CL-ML, CL	A-4, A-6	0	0	100	100	85-100	85-100	25-35	5-15
1144:												
Blake-----------	0-7	Silty clay loam	CL	A-7, A-6	0	0	100	100	90-100	85-95	35-50	15-30
	7-26	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	90-100	85-95	30-50	10-30
	26-60	Silt loam, loam, very fine sandy loam.	ML, CL	A-4, A-6	0	0	100	100	80-90	75-90	30-40	5-15

Table 21.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
1145:												
Onawa-----------	0-8	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	80-100	25-40	5-20
	8-22	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	95-100	60-85	40-60
	22-60	Silt loam, very fine sandy loam, loam.	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	85-100	25-40	5-20
1146:												
Onawa-----------	0-7	Silty clay-----	CH	A-7	0	0	100	100	95-100	95-100	60-85	40-60
	7-23	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	95-100	60-85	40-60
	23-60	Silt loam, very fine sandy loam, loam.	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	85-100	25-40	5-20
1147:												
Modale----------	0-24	Silty clay loam	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	80-90	25-40	5-15
	24-60	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	95-100	65-85	40-60
1150:												
Modale----------	0-24	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	80-90	25-40	5-15
	24-60	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	95-100	65-85	40-60
1155:												
Albaton---------	0-15	Silty clay loam	CL, CH	A-7	0	0	100	100	95-100	90-100	40-60	20-35
	15-60	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	95-100	60-85	40-60
1156:												
Albaton---------	0-15	Silty clay-----	CH	A-7	0	0	100	100	95-100	95-100	60-85	40-60
	15-60	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	95-100	60-85	40-60
1157:												
Albaton---------	0-15	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	90-100	25-40	5-15
	15-60	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	95-100	60-85	40-60
1220:												
Nodaway---------	0-8	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	90-100	25-35	5-15
	8-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	90-100	25-40	5-15

Table 21.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification Unified	Classification AASHTO	Fragments >10 inches	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct	Pct					Pct	
1237:												
Sarpy-----------	0-6	Loamy fine sand	SM	A-2-4	0	0	100	100	60-80	15-35	---	NP
	6-60	Fine sand, loamy fine sand, sand.	SM, SP, SP-SM	A-2-4, A-3	0	0	100	100	60-80	2-35	---	NP
1237B:												
Sarpy-----------	0-6	Loamy fine sand	SM	A-2-4	0	0	100	100	60-80	15-35	---	NP
	6-60	Fine sand, loamy fine sand, sand.	SM, SP, SP-SM	A-2-4, A-3	0	0	100	100	60-80	2-35	---	NP
1514:												
Grable----------	0-10	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	80-95	80-95	25-40	5-20
	10-23	Silt loam, very fine sandy loam.	CL, CL-ML	A-4, A-6	0	0	100	100	80-95	80-95	0-25	5-15
	23-60	Fine sand, loamy sand, sand.	SM, SC-SM, SP-SM	A-2, A-3	0	0	100	100	65-80	5-35	0-20	NP-5
1515:												
Percival--------	0-6	Silty clay-----	CH	A-7	0	0	100	100	95-100	95-100	60-85	35-60
	6-23	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	95-100	60-85	35-60
	23-60	Stratified fine sand to loamy fine sand.	SM, SC-SM, SP-SM	A-2	0	0	100	100	80-95	12-30	0-20	NP-5
1516:												
Vore------------	0-24	Silty clay loam	CL	A-7, A-6	0	0	100	100	95-100	90-100	35-50	15-25
	24-60	Fine sand, loamy fine sand.	SW-SM, SP-SM, SM, SC-SM	A-3, A-2-4	0	0	100	100	80-90	5-20	0-20	NP-5
1524:												
Morconick-------	0-7	Very fine sandy loam.	CL, CL-ML	A-4, A-6	0	0	100	100	80-95	80-95	25-40	5-20
	7-13	Silt loam, very fine sandy loam, loam.	CL, CL-ML	A-4, A-6	0	0	100	100	80-95	80-95	0-25	5-15
	13-57	Stratified fine sand to loam.	SM, SC-SM, SP-SM	A-3, A-2-4	0	0	100	100	65-95	5-40	0-20	NP-5
	57-80	Stratified loamy fine sand to sand.	SC, SC-SM, SP-SC	A-2-4, A-2-6	0	0	100	85-100	65-95	5-30	0-25	5-15

Table 21.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
1525:												
Scroll----------	0-7	Silty clay-----	CH	A-7	0	0	100	100	95-100	95-100	60-85	35-60
	7-11	Silt loam------	CL, ML	A-6, A-4, A-5	0	0	100	100	95-100	95-100	25-50	8-20
	11-60	Loamy fine sand, fine sandy loam.	SM, SW-SM, SC-SM	A-3, A-2-4, A-4	0	0	100	100	80-95	25-45	0-20	NP-5
1526:												
Scroll----------	0-8	Silty clay loam	CH	A-7	0	0	100	100	95-100	90-100	50-60	25-35
	8-12	Silt loam------	CL, ML	A-6, A-4, A-5	0	0	100	100	95-100	95-100	25-50	8-20
	12-60	Loamy fine sand, fine sandy loam.	SM, SW-SM, SC-SM	A-3, A-2-4, A-4	0	0	100	100	80-95	25-45	0-20	NP-5
1552:												
Owego-----------	0-8	Silty clay-----	CH	A-7	0	0	100	100	95-100	95-100	60-85	30-55
	8-30	Silt loam, silty clay loam, clay loam.	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	90-100	25-40	5-15
	30-60	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	95-100	60-85	30-55
1746:												
Lossing---------	0-6	Silty clay-----	CH	A-7	0	0	100	100	95-100	95-100	60-85	30-55
	6-10	Silty clay-----	CH	A-7	0	0	100	100	95-100	95-100	60-85	30-55
	10-14	Silty clay loam	CL	A-7, A-6	0	0	100	100	99-100	95-100	35-50	15-30
	14-71	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	80-100	25-40	5-20
	71-89	Fine sandy loam	SM	A-2-4	0	0	100	100	56-80	30-45	0-20	NP-5
1747:												
Rodney----------	0-9	Silty clay-----	CH	A-7	0	0	100	100	95-100	95-100	60-85	30-55
	9-28	Silt loam, loam	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	80-100	25-40	5-20
	28-60	Silty clay-----	CH	A-7	0	0	100	100	95-100	95-100	60-85	30-55

Table 21.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
1750:												
Ticonic---------	0-8	Fine sand------	SM, SP-SM, SP	A-2-4, A-3	0	0	100	95-100	60-80	2-15	0-14	NP
	8-28	Stratified sand to loamy fine sand.	SM, SP-SM, SP	A-2-4, A-3	0	0	100	95-100	60-80	2-15	0-14	NP
	28-52	Stratified loamy fine sand to silt loam.	ML, CL-ML	A-6, A-4	0	0	100	85-95	80-90	60-80	25-40	5-12
	52-72	Stratified loam to fine sand.	SM, SC-SM, SC	A-4, A-2-4	0	0	100	95-100	55-95	25-45	20-30	2-8
	72-80	Stratified silty clay to silty clay loam.	CL, CH	A-7	0	0	100	100	95-100	75-95	40-65	15-35
1849:												
Kenmoor---------	0-7	Fine sandy loam	ML, SM, CL-ML, SC-SM	A-4	0	0	100	100	80-95	45-65	0-25	NP-5
	7-33	Sand, loamy fine sand, fine sand.	SM	A-2, A-4	0	0	100	100	65-80	15-40	0-14	NP
	33-60	Silty clay loam, silty clay, clay.	CH, CL	A-7	0	0	100	100	95-100	75-95	40-70	25-45
5010:												
Pits------------	0-60	Sand and gravel	GP, SP, GP-GM, SP-SM	---	0	0-10	0	0	0	0	---	NP
5040:												
Orthents--------	0-60	Loam-----------	---	---	0	0	0	0	0	0	---	NP-15
	60-80	Variable-------	---	---	0	0	0	0	0	0	---	NP
5044:												
Fluvaquents.												
5045, 5046, 5047:												
Aquents---------	0-40	Variable-------	---	---	---	---	---	---	---	---	---	---
5051:												
Fluvaquents-----	0-60	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	85-100	60-95	25-35	5-15
	60-80	Variable-------			0	0	0	0	0	0	0-14	NP

Table 21.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
5090:												
Aquents---------	0-40	Variable-------	---	---	---	---	---	---	---	---	---	---
Orthents.												

Table 22.--Physical Properties of the Soils

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodibility index" apply only to the surface layer. Absence of an entry indicates that data were not estimated)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
1C:												
Ida-------------	0-8	18-25	1.20-1.30	0.60-2.00	0.20-0.22	Low------	2.0-3.0	0.32	0.32	5	4L	86
	8-60	18-25	1.20-1.30	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
1C3:												
Ida-------------	0-8	18-25	1.20-1.30	0.60-2.00	0.20-0.22	Low------	1.0-2.0	0.43	0.43	4	4L	86
	8-60	18-25	1.20-1.30	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
1D:												
Ida-------------	0-8	18-25	1.20-1.30	0.60-2.00	0.20-0.22	Low------	2.0-3.0	0.32	0.32	5	4L	86
	8-60	18-25	1.20-1.30	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
1D3:												
Ida-------------	0-8	18-25	1.20-1.30	0.60-2.00	0.20-0.22	Low------	1.0-2.0	0.43	0.43	4	4L	86
	8-60	18-25	1.20-1.30	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
1E:												
Ida-------------	0-8	18-25	1.20-1.30	0.60-2.00	0.20-0.22	Low------	2.0-3.0	0.32	0.32	5	4L	86
	8-60	18-25	1.20-1.30	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
1E3:												
Ida-------------	0-8	18-25	1.20-1.30	0.60-2.00	0.20-0.22	Low------	1.0-2.0	0.43	0.43	4	4L	86
	8-60	18-25	1.20-1.30	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
1F:												
Ida-------------	0-8	18-25	1.20-1.30	0.60-2.00	0.20-0.22	Low------	2.0-3.0	0.32	0.32	5	4L	86
	8-60	18-25	1.20-1.30	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
1F3:												
Ida-------------	0-8	18-25	1.20-1.30	0.60-2.00	0.20-0.22	Low------	1.0-2.0	0.43	0.43	4	4L	86
	8-60	18-25	1.20-1.30	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
1G:												
Ida-------------	0-8	18-25	1.20-1.30	0.60-2.00	0.20-0.22	Low------	2.0-3.0	0.32	0.32	5	4L	86
	8-60	18-25	1.20-1.30	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
2G:												
Hamburg---------	0-4	6-12	1.20-1.30	0.60-2.00	0.20-0.24	Low------	0.5-2.0	0.43	0.43	5	4L	86
	4-60	6-12	1.20-1.30	0.60-2.00	0.17-0.22	Low------	---	0.43	0.43			
3D:												
Castana---------	0-18	18-22	1.20-1.25	0.60-2.00	0.22-0.24	Low------	2.0-3.0	0.28	0.28	5	4L	86
	18-60	18-24	1.20-1.30	0.60-2.00	0.20-0.22	Low------	0.0-1.0	0.43	0.43			
3E:												
Castana---------	0-14	18-22	1.20-1.25	0.60-2.00	0.22-0.24	Low------	2.0-3.0	0.28	0.28	5	4L	86
	14-60	18-24	1.20-1.30	0.60-2.00	0.20-0.22	Low------	0.0-1.0	0.43	0.43			
3F:												
Castana---------	0-14	18-22	1.20-1.25	0.60-2.00	0.22-0.24	Low------	2.0-3.0	0.28	0.28	5	4L	86
	14-60	18-24	1.20-1.30	0.60-2.00	0.20-0.22	Low------	0.0-1.0	0.43	0.43			
10B:												
Monona----------	0-14	20-27	1.25-1.30	0.60-2.00	0.22-0.24	Moderate	3.0-4.0	0.28	0.28	5	6	48
	14-54	24-28	1.30-1.35	0.60-2.00	0.20-0.22	Moderate	0.0-1.0	0.43	0.43			
	54-60	18-24	1.35-1.40	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			

Table 22.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in		Pct					
10C:												
Monona----------	0-14	20-27	1.25-1.30	0.60-2.00	0.22-0.24	Moderate	3.0-4.0	0.28	0.28	5	6	48
	14-54	24-28	1.30-1.35	0.60-2.00	0.20-0.22	Moderate	0.0-1.0	0.43	0.43			
	54-60	18-24	1.35-1.40	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
10C2:												
Monona----------	0-8	20-27	1.25-1.30	0.60-2.00	0.22-0.24	Moderate	2.0-3.0	0.32	0.32	5	6	48
	8-30	24-28	1.30-1.35	0.60-2.00	0.20-0.22	Moderate	0.0-1.0	0.43	0.43			
	30-60	18-24	1.35-1.40	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
10C3:												
Monona----------	0-8	20-27	1.25-1.30	0.60-2.00	0.22-0.24	Moderate	1.0-2.0	0.43	0.43	4	6	48
	8-30	24-28	1.30-1.35	0.60-2.00	0.20-0.22	Moderate	0.0-0.5	0.43	0.43			
	30-60	18-24	1.35-1.40	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
10D:												
Monona----------	0-14	20-27	1.25-1.30	0.60-2.00	0.22-0.24	Moderate	3.0-4.0	0.28	0.28	5	6	48
	14-54	24-28	1.30-1.35	0.60-2.00	0.20-0.22	Moderate	0.0-1.0	0.43	0.43			
	54-60	18-24	1.35-1.40	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
10D2:												
Monona----------	0-8	20-27	1.25-1.30	0.60-2.00	0.22-0.24	Moderate	2.0-3.0	0.32	0.32	5	6	48
	8-30	24-28	1.30-1.35	0.60-2.00	0.20-0.22	Moderate	0.0-1.0	0.43	0.43			
	30-60	18-24	1.35-1.40	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
10D3:												
Monona----------	0-8	20-27	1.25-1.30	0.60-2.00	0.22-0.24	Moderate	1.0-2.0	0.43	0.43	4	6	48
	8-30	24-28	1.30-1.35	0.60-2.00	0.20-0.22	Moderate	0.0-0.5	0.43	0.43			
	30-60	18-24	1.35-1.40	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
10E:												
Monona----------	0-14	20-27	1.25-1.30	0.60-2.00	0.22-0.24	Moderate	3.0-4.0	0.28	0.28	5	6	48
	14-54	24-28	1.30-1.35	0.60-2.00	0.20-0.22	Moderate	0.0-1.0	0.43	0.43			
	54-60	18-24	1.35-1.40	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
10E2:												
Monona----------	0-8	20-27	1.25-1.30	0.60-2.00	0.22-0.24	Moderate	2.0-3.0	0.32	0.32	5	6	48
	8-30	24-28	1.30-1.35	0.60-2.00	0.20-0.22	Moderate	0.0-1.0	0.43	0.43			
	30-60	18-24	1.35-1.40	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
10E3:												
Monona----------	0-8	20-27	1.25-1.30	0.60-2.00	0.22-0.24	Moderate	1.0-2.0	0.43	0.43	4	6	48
	8-30	24-28	1.30-1.35	0.60-2.00	0.20-0.22	Moderate	0.0-0.5	0.43	0.43			
	30-60	18-24	1.35-1.40	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
10F:												
Monona----------	0-14	20-27	1.25-1.30	0.60-2.00	0.22-0.24	Moderate	3.0-4.0	0.28	0.28	5	6	48
	14-54	24-28	1.30-1.35	0.60-2.00	0.20-0.22	Moderate	0.0-1.0	0.43	0.43			
	54-60	18-24	1.35-1.40	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
10F2:												
Monona----------	0-8	20-27	1.25-1.30	0.60-2.00	0.22-0.24	Moderate	2.0-3.0	0.32	0.32	5	6	48
	8-30	24-28	1.30-1.35	0.60-2.00	0.20-0.22	Moderate	0.0-1.0	0.43	0.43			
	30-60	18-24	1.35-1.40	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
10F3:												
Monona----------	0-8	20-27	1.25-1.30	0.60-2.00	0.22-0.24	Moderate	1.0-2.0	0.43	0.43	4	6	48
	8-30	24-28	1.30-1.35	0.60-2.00	0.20-0.22	Moderate	0.0-0.5	0.43	0.43			
	30-60	18-24	1.35-1.40	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			

Table 22.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
10G:												
Monona----------	0-14	20-27	1.25-1.30	0.60-2.00	0.22-0.24	Moderate	3.0-4.0	0.28	0.28	5	6	48
	14-54	24-28	1.30-1.35	0.60-2.00	0.20-0.22	Moderate	0.0-1.0	0.43	0.43			
	54-60	18-24	1.35-1.40	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
12B:												
Napier----------	0-28	20-27	1.20-1.25	0.60-2.00	0.22-0.24	Low------	3.0-4.0	0.28	0.28	5	6	48
	28-60	20-27	1.25-1.30	0.60-2.00	0.20-0.22	Low------	1.0-2.0	0.43	0.43			
12C:												
Napier----------	0-28	20-27	1.20-1.25	0.60-2.00	0.22-0.24	Low------	3.0-4.0	0.28	0.28	5	6	48
	28-60	20-27	1.25-1.30	0.60-2.00	0.20-0.22	Low------	1.0-2.0	0.43	0.43			
12D:												
Napier----------	0-28	20-27	1.20-1.25	0.60-2.00	0.22-0.24	Low------	3.0-4.0	0.28	0.28	5	6	48
	28-60	20-27	1.25-1.30	0.60-2.00	0.20-0.22	Low------	1.0-2.0	0.43	0.43			
17B:												
Napier----------	0-28	20-27	1.20-1.25	0.60-2.00	0.22-0.24	Low------	3.0-4.0	0.28	0.28	5	6	48
	28-60	20-27	1.25-1.30	0.60-2.00	0.20-0.22	Low------	1.0-2.0	0.43	0.43			
Kennebec--------	0-48	22-27	1.25-1.35	0.60-2.00	0.22-0.24	Moderate	5.0-6.0	0.28	0.28	5	6	48
	48-60	24-28	1.35-1.40	0.60-2.00	0.20-0.22	Moderate	1.0-2.0	0.43	0.43			
Colo------------	0-16	27-36	1.28-1.32	0.60-2.00	0.21-0.23	Moderate	5.0-7.0	0.28	0.28	5	7	38
	16-40	30-35	1.25-1.35	0.60-2.00	0.18-0.20	Moderate	3.0-4.0	0.28	0.28			
	40-60	25-35	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	1.0-2.0	0.32	0.32			
33D:												
Steinauer-------	0-6	27-32	1.20-1.35	0.20-0.60	0.19-0.22	Moderate	0.5-2.0	0.32	0.32	5	4L	86
	6-12	27-32	1.30-1.50	0.20-0.60	0.17-0.19	Moderate	0.5-1.0	0.37	0.37			
	12-60	24-35	1.30-1.65	0.20-0.60	0.16-0.19	Moderate	0.0-0.5	0.37	0.37			
33E:												
Steinauer-------	0-6	27-32	1.20-1.35	0.20-0.60	0.19-0.22	Moderate	0.5-2.0	0.32	0.32	5	4L	86
	6-12	27-32	1.30-1.50	0.20-0.60	0.17-0.19	Moderate	0.5-1.0	0.37	0.37			
	12-60	24-35	1.30-1.65	0.20-0.60	0.16-0.19	Moderate	0.0-0.5	0.37	0.37			
33F:												
Steinauer-------	0-6	27-32	1.20-1.35	0.20-0.60	0.19-0.22	Moderate	0.5-2.0	0.32	0.32	5	4L	86
	6-12	27-32	1.30-1.50	0.20-0.60	0.17-0.19	Moderate	0.5-1.0	0.37	0.37			
	12-60	24-35	1.30-1.65	0.20-0.60	0.16-0.19	Moderate	0.0-0.5	0.37	0.37			
33G:												
Steinauer-------	0-6	27-32	1.20-1.35	0.20-0.60	0.19-0.22	Moderate	0.5-2.0	0.32	0.32	5	4L	86
	6-12	27-32	1.30-1.50	0.20-0.60	0.17-0.19	Moderate	0.5-1.0	0.37	0.37			
	12-60	24-35	1.30-1.65	0.20-0.60	0.16-0.19	Moderate	0.0-0.5	0.37	0.37			
36:												
Salix-----------	0-17	27-30	1.25-1.30	0.60-2.00	0.21-0.23	Moderate	3.0-4.0	0.28	0.28	5	7	38
	17-23	28-38	1.30-1.35	0.60-2.00	0.18-0.20	Moderate	1.0-2.0	0.43	0.43			
	23-60	16-22	1.35-1.45	0.60-2.00	0.20-0.22	Low------	0.0-1.0	0.43	0.43			
44:												
Blencoe---------	0-27	40-55	1.30-1.35	0.06-0.20	0.12-0.14	High-----	3.0-5.0	0.28	0.28	5	4	86
	27-33	35-50	1.30-1.35	0.06-0.20	0.18-0.20	High-----	1.0-3.0	0.43	0.43			
	33-60	18-24	1.35-1.40	0.60-2.00	0.20-0.22	Moderate	0.5-1.0	0.43	0.43			
46:												
Keg-------------	0-17	20-26	1.20-1.25	0.60-2.00	0.21-0.23	Low------	2.0-4.0	0.28	0.28	5	6	48
	17-60	18-22	1.25-1.40	0.60-2.00	0.20-0.22	Low------	0.5-1.0	0.43	0.43			

Table 22.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors K	Kf	T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
54:												
Zook------------	0-30	35-40	1.30-1.35	0.20-0.60	0.21-0.23	High-----	5.0-7.0	0.37	0.37	5	7	38
	30-40	36-45	1.30-1.45	0.06-0.20	0.11-0.13	High-----	2.0-4.0	0.28	0.28			
	40-60	20-45	1.30-1.45	0.06-0.60	0.11-0.22	High-----	0.0-1.0	0.28	0.28			
54+:												
Zook------------	0-15	20-26	1.30-1.35	0.60-2.00	0.22-0.24	Moderate	2.0-4.0	0.37	0.37	4	6	48
	15-45	36-45	1.30-1.45	0.06-0.20	0.11-0.13	High-----	2.0-4.0	0.28	0.28			
	45-60	20-45	1.30-1.45	0.06-0.60	0.11-0.22	High-----	0.0-1.0	0.28	0.28			
66:												
Luton-----------	0-14	40-60	1.30-1.35	0.01-0.06	0.12-0.14	High-----	3.0-5.0	0.28	0.28	5	4	86
	14-30	60-70	1.30-1.35	0.01-0.06	0.12-0.14	High-----	0.0-1.0	0.28	0.28			
	30-60	60-70	1.35-1.45	0.01-0.06	0.11-0.13	High-----	0.0-1.0	0.28	0.28			
66+:												
Luton-----------	0-9	20-27	1.25-1.30	0.60-2.00	0.22-0.24	Moderate	1.0-2.0	0.43	0.43	5	6	48
	9-22	60-70	1.30-1.35	0.01-0.06	0.12-0.14	High-----	0.0-1.0	0.28	0.28			
	22-80	60-70	1.35-1.45	0.01-0.06	0.11-0.13	High-----	0.0-1.0	0.28	0.28			
67:												
Woodbury--------	0-24	40-55	1.30-1.35	0.06-0.20	0.12-0.14	High-----	5.0-7.0	0.28	0.28	5	4	86
	24-36	40-50	1.30-1.35	0.06-0.20	0.11-0.13	High-----	2.0-3.0	0.32	0.32			
	36-60	28-35	1.30-1.40	0.20-0.60	0.18-0.20	High-----	1.0-2.0	0.43	0.43			
68:												
Napa------------	0-1	27-40	1.15-1.25	0.20-0.60	0.16-0.18	Moderate	2.0-5.0	0.37	0.37	2	7	38
	1-30	45-60	1.20-1.30	0.00-0.06	0.13-0.18	Very high	0.5-2.0	0.37	0.37			
	30-60	35-50	1.25-1.35	0.00-0.06	0.11-0.16	High-----	0.0-1.0	0.37	0.37			
70:												
McPaul----------	0-60	10-18	1.20-1.30	0.60-2.00	0.21-0.23	Low------	1.0-2.0	0.32	0.32	5	4L	86
123:												
Grantcenter-----	0-23	24-32	1.25-1.40	0.60-2.00	0.22-0.24	Moderate	5.0-6.0	0.28	0.28	5	6	48
	23-56	15-30	1.25-1.40	0.60-2.00	0.22-0.24	Moderate	1.0-2.0	0.43	0.43			
	56-60	14-26	1.25-1.40	0.60-6.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
133:												
Colo------------	0-16	27-36	1.28-1.32	0.60-2.00	0.21-0.23	Moderate	5.0-7.0	0.28	0.28	5	7	38
	16-40	30-35	1.25-1.35	0.60-2.00	0.18-0.20	Moderate	3.0-4.0	0.28	0.28			
	40-60	25-35	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	1.0-2.0	0.32	0.32			
133+:												
Colo------------	0-16	20-26	1.25-1.30	0.60-2.00	0.22-0.24	Moderate	3.0-5.0	0.28	0.28	5	6	48
	16-40	30-35	1.25-1.35	0.60-2.00	0.18-0.20	Moderate	3.0-4.0	0.28	0.28			
	40-60	25-35	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	1.0-2.0	0.32	0.32			
137:												
Haynie----------	0-7	15-25	1.20-1.35	0.60-2.00	0.18-0.23	Low------	1.0-3.0	0.32	0.32	5	4L	86
	7-60	15-18	1.20-1.35	0.60-2.00	0.18-0.23	Low------	0.0-1.0	0.43	0.43			
144:												
Blake-----------	0-7	27-38	1.25-1.30	0.60-2.00	0.20-0.22	Moderate	1.0-3.0	0.32	0.32	5	4L	86
	7-26	22-35	1.25-1.30	0.60-2.00	0.20-0.22	Moderate	0.0-1.0	0.43	0.43			
	26-60	10-20	1.30-1.35	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
145:												
Onawa-----------	0-7	15-22	1.20-1.25	0.60-2.00	0.22-0.24	Low------	1.0-2.0	0.37	0.37	5	4L	86
	7-23	50-60	1.30-1.40	0.06-0.20	0.12-0.14	High-----	0.0-1.0	0.28	0.28			
	23-60	12-18	1.40-1.50	0.60-6.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			

Table 22.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
146:												
Onawa-----------	0-7	40-55	1.30-1.35	0.20-0.60	0.12-0.14	High-----	2.0-3.0	0.32	0.32	5	4	86
	7-23	50-60	1.30-1.40	0.06-0.20	0.12-0.14	High-----	0.0-1.0	0.28	0.28			
	23-60	12-18	1.40-1.50	0.60-6.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
147:												
Modale----------	0-24	27-30	1.20-1.30	0.60-2.00	0.21-0.23	Moderate	1.0-3.0	0.37	0.37	5	4L	86
	24-60	50-60	1.35-1.45	0.00-0.20	0.11-0.13	High-----	0.5-1.0	0.28	0.28			
149:												
Modale----------	0-24	10-18	1.20-1.30	0.60-2.00	0.21-0.23	Low------	1.0-3.0	0.37	0.37	5	4L	86
	24-60	50-60	1.35-1.45	0.00-0.20	0.11-0.13	High-----	0.5-1.0	0.28	0.28			
155:												
Albaton---------	0-15	27-40	1.30-1.35	0.20-2.00	0.20-0.22	Moderate	2.0-3.0	0.37	0.37	5	4L	86
	15-60	50-60	1.35-1.45	0.01-0.06	0.11-0.13	Very high	0.0-1.0	0.28	0.28			
156:												
Albaton---------	0-15	40-60	1.35-1.40	0.01-0.20	0.11-0.13	Very high	2.0-3.0	0.28	0.28	5	4	86
	15-60	50-60	1.35-1.45	0.01-0.06	0.11-0.13	Very high	0.0-1.0	0.28	0.28			
157:												
Albaton---------	0-15	22-27	1.30-1.35	0.60-2.00	0.22-0.24	Moderate	1.0-2.0	0.37	0.37	5	4L	86
	15-60	50-60	1.35-1.45	0.01-0.06	0.11-0.13	Very high	0.0-1.0	0.28	0.28			
212:												
Kennebec--------	0-48	22-27	1.25-1.35	0.60-2.00	0.22-0.24	Moderate	5.0-6.0	0.28	0.28	5	6	48
	48-60	24-28	1.35-1.40	0.60-2.00	0.20-0.22	Moderate	1.0-2.0	0.43	0.43			
212+:												
Kennebec--------	0-18	22-27	1.25-1.35	0.60-2.00	0.22-0.24	Moderate	5.0-6.0	0.28	0.28	5	6	48
	18-60	24-28	1.35-1.40	0.60-2.00	0.20-0.22	Moderate	1.0-2.0	0.43	0.43			
220:												
Nodaway---------	0-8	18-27	1.25-1.35	0.60-2.00	0.20-0.23	Low------	2.0-3.0	0.32	0.32	5	6	48
	8-60	18-28	1.25-1.35	0.60-2.00	0.20-0.23	Moderate	0.0-0.5	0.43	0.43			
234:												
Nishna----------	0-30	36-40	1.30-1.35	0.06-0.20	0.12-0.14	High-----	4.0-6.0	0.37	0.37	5	4	86
	30-60	38-46	1.35-1.40	0.06-0.20	0.11-0.13	High-----	1.0-2.0	0.28	0.28			
237:												
Sarpy-----------	0-6	2-5	1.20-1.50	6.00-20.00	0.05-0.09	Low------	0.5-1.0	0.17	0.17	5	2	134
	6-60	2-5	1.20-1.50	6.00-20.00	0.05-0.09	Low------	0.0-0.5	0.15	0.15			
237B:												
Sarpy-----------	0-6	2-5	1.20-1.50	6.00-20.00	0.05-0.09	Low------	0.5-1.0	0.17	0.17	5	2	134
	6-60	2-5	1.20-1.50	6.00-20.00	0.05-0.09	Low------	0.0-0.5	0.15	0.15			
244:												
Blend-----------	0-20	40-60	1.30-1.35	0.06-0.20	0.12-0.14	High-----	3.0-5.0	0.28	0.28	5	4	86
	20-31	30-40	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	1.0-2.0	0.28	0.28			
	31-60	40-60	1.35-1.40	0.00-0.06	0.11-0.13	High-----	0.5-1.0	0.28	0.28			
255:												
Cooper----------	0-12	27-34	1.25-1.30	0.60-2.00	0.19-0.21	Moderate	3.0-4.0	0.32	0.32	5	7	38
	12-25	27-34	1.30-1.35	0.60-2.00	0.18-0.20	Moderate	1.0-2.0	0.28	0.28			
	25-60	40-60	1.35-1.40	0.06-0.20	0.11-0.13	High-----	0.0-0.5	0.28	0.28			
257:												
Uturin----------	0-25	20-27	1.25-1.35	0.60-2.00	0.20-0.23	Low------	0.5-1.0	0.37	0.37	5	6	48
	25-80	35-46	1.35-1.40	0.06-0.20	0.11-0.13	High-----	2.0-4.0	0.28	0.28			

Table 22.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors K	Kf	T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
266:												
Smithland-------	0-16	27-36	1.28-1.32	0.60-2.00	0.21-0.23	Moderate	5.0-7.0	0.28	0.28	5	7	38
	16-40	30-35	1.25-1.35	0.60-2.00	0.18-0.20	Moderate	3.0-4.0	0.28	0.28			
	40-60	25-35	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	1.0-2.0	0.32	0.32			
275:												
Moville---------	0-29	10-18	1.25-1.30	0.60-2.00	0.21-0.23	Low------	1.0-3.0	0.37	0.37	5	4L	86
	29-60	50-60	1.35-1.45	0.00-0.06	0.11-0.13	High-----	3.0-4.0	0.28	0.28			
366:												
Luton-----------	0-14	35-40	1.30-1.35	0.60-2.00	0.21-0.23	High-----	3.0-5.0	0.32	0.32	5	4	86
	14-25	60-70	1.30-1.35	0.01-0.06	0.12-0.14	High-----	0.0-1.0	0.28	0.28			
	25-60	60-70	1.35-1.45	0.01-0.06	0.11-0.13	High-----	0.0-1.0	0.28	0.28			
430:												
Ackmore---------	0-10	18-27	1.25-1.30	0.60-2.00	0.21-0.23	Moderate	2.0-4.0	0.32	0.32	5	6	48
	10-23	18-30	1.25-1.30	0.60-2.00	0.21-0.23	Moderate	1.0-3.0	0.32	0.32			
	23-60	26-38	1.30-1.40	0.60-2.00	0.18-0.20	High-----	3.0-5.0	0.32	0.32			
436:												
Lakeport--------	0-10	32-38	1.30-1.35	0.20-2.00	0.18-0.20	High-----	3.0-4.0	0.28	0.28	5	4	86
	10-26	35-38	1.30-1.35	0.20-2.00	0.18-0.20	High-----	1.0-2.0	0.32	0.32			
	26-47	35-42	1.35-1.40	0.20-2.00	0.17-0.19	High-----	0.5-1.0	0.43	0.43			
	47-60	18-30	1.40-1.50	0.60-2.00	0.17-0.19	Moderate	0.0-0.5	0.43	0.43			
446:												
Burcham---------	0-25	18-27	1.35-1.45	0.60-2.00	0.21-0.23	Moderate	3.0-5.0	0.32	0.32	5	6	48
	25-60	40-50	1.30-1.35	0.00-0.20	0.11-0.13	High-----	2.0-3.0	0.32	0.32			
465:												
Tieville--------	0-22	40-60	1.35-1.45	0.00-0.06	0.12-0.14	High-----	2.0-4.0	0.28	0.28	5	4L	86
	22-60	40-70	1.35-1.45	0.00-0.06	0.08-0.12	High-----	1.0-2.0	0.28	0.28			
510:												
Monona----------	0-14	20-27	1.25-1.30	0.60-2.00	0.22-0.24	Moderate	3.0-4.0	0.28	0.28	5	6	48
	14-54	24-28	1.30-1.35	0.60-2.00	0.20-0.22	Moderate	0.0-1.0	0.43	0.43			
	54-60	18-24	1.35-1.40	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
510B:												
Monona----------	0-14	20-27	1.25-1.30	0.60-2.00	0.22-0.24	Moderate	3.0-4.0	0.28	0.28	5	6	48
	14-54	24-28	1.30-1.35	0.60-2.00	0.20-0.22	Moderate	0.0-1.0	0.43	0.43			
	54-60	18-24	1.35-1.40	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
510C:												
Monona----------	0-14	20-27	1.25-1.30	0.60-2.00	0.22-0.24	Moderate	3.0-4.0	0.28	0.28	5	6	48
	14-54	24-28	1.30-1.35	0.60-2.00	0.20-0.22	Moderate	0.0-1.0	0.43	0.43			
	54-60	18-24	1.35-1.40	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
510C2:												
Monona----------	0-8	20-27	1.25-1.30	0.60-2.00	0.22-0.24	Moderate	2.0-3.0	0.32	0.32	5	6	48
	8-30	24-28	1.30-1.35	0.60-2.00	0.20-0.22	Moderate	0.0-1.0	0.43	0.43			
	30-60	18-24	1.35-1.40	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
510C3:												
Monona----------	0-8	20-27	1.25-1.30	0.60-2.00	0.22-0.24	Moderate	1.0-2.0	0.43	0.43	4	6	48
	8-30	24-28	1.30-1.35	0.60-2.00	0.20-0.22	Moderate	0.0-0.5	0.43	0.43			
	30-60	18-24	1.35-1.40	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
514:												
Grable----------	0-10	18-27	1.20-1.25	0.60-2.00	0.22-0.24	Low------	1.0-3.0	0.32	0.32	4	4L	86
	10-23	12-16	1.25-1.50	0.60-2.00	0.20-0.22	Low------	0.0-1.0	0.43	0.43			
	23-60	2-10	1.20-1.50	6.00-20.00	0.02-0.07	Low------	0.0-0.5	0.15	0.15			

Table 22.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors K	Kf	T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
515:												
Percival--------	0-6	40-60	1.30-1.35	0.06-0.20	0.10-0.12	High-----	1.0-3.0	0.28	0.28	4	4	86
	6-23	40-60	1.30-1.35	0.06-0.20	0.10-0.12	High-----	0.0-2.0	0.28	0.28			
	23-60	2-12	1.30-1.50	6.00-20.00	0.02-0.04	Low------	0.0-0.5	0.15	0.15			
516:												
Vore------------	0-24	28-35	1.30-1.35	0.60-2.00	0.19-0.22	Moderate	2.0-3.0	0.32	0.32	4	4L	86
	24-60	4-12	1.35-1.50	6.00-20.00	0.05-0.07	Low------	0.0-1.0	0.10	0.10			
552:												
Owego-----------	0-17	40-50	1.30-1.35	0.00-0.06	0.12-0.14	High-----	2.0-4.0	0.32	0.32	5	4	86
	17-25	15-30	1.30-1.40	0.60-2.00	0.20-0.22	Moderate	0.0-1.0	0.37	0.37			
	25-60	48-58	1.35-1.45	0.00-0.06	0.11-0.13	High-----	0.0-0.5	0.32	0.32			
553:												
Forney----------	0-15	40-60	1.30-1.35	0.01-0.06	0.11-0.13	High-----	2.0-4.0	0.28	0.28	5	4	86
	15-60	50-60	1.35-1.45	0.01-0.06	0.11-0.13	High-----	0.0-3.0	0.28	0.28			
670:												
Rawles----------	0-28	18-27	1.25-1.35	0.60-2.00	0.21-0.23	Moderate	1.0-3.0	0.32	0.32	5	4L	86
	28-60	22-35	1.35-1.40	0.60-2.00	0.19-0.21	Moderate	3.0-4.0	0.32	0.32			
717D:												
Napier----------	0-28	20-27	1.20-1.25	0.60-2.00	0.22-0.24	Low------	3.0-4.0	0.28	0.28	5	6	48
	28-60	20-27	1.25-1.30	0.60-2.00	0.20-0.22	Low------	1.0-2.0	0.43	0.43			
Gullied land.												
746:												
Lossing---------	0-6	40-60	1.30-1.35	0.06-0.20	0.12-0.14	High-----	2.0-3.0	0.28	0.28	5	4	86
	6-10	40-55	1.30-1.40	0.06-0.20	0.12-0.14	High-----	1.0-2.0	0.28	0.28			
	10-14	27-35	1.25-1.30	0.20-0.60	0.20-0.22	High-----	0.0-1.0	0.32	0.32			
	14-71	15-24	1.40-1.50	0.60-6.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
	71-80	2-10	1.20-1.50	6.00-2.00	0.02-0.07	Low------	0.0-0.5	0.43	0.43			
747:												
Rodney----------	0-9	40-60	1.30-1.35	0.06-0.20	0.12-0.14	High-----	3.0-4.0	0.28	0.28	5	4	86
	9-28	14-26	1.30-1.40	0.60-6.00	0.20-0.22	Low------	0.5-2.0	0.43	0.43			
	28-60	40-65	1.35-1.45	0.06-0.20	0.12-0.14	High-----	0.0-2.0	0.32	0.32			
748:												
Hornick---------	0-9	40-50	1.30-1.35	0.06-0.20	0.12-0.14	High-----	4.0-6.0	0.28	0.28	5	4	86
	9-19	20-27	1.25-1.40	0.60-2.00	0.20-0.22	Moderate	1.0-3.0	0.32	0.32			
	19-30	20-27	1.25-1.40	0.60-2.00	0.20-0.22	Moderate	0.0-1.0	0.32	0.32			
	30-80	40-55	1.35-1.45	0.06-0.20	0.12-0.14	High-----	0.0-0.5	0.32	0.32			
754:												
Larpenteur------	0-14	20-30	1.20-1.25	0.60-2.00	0.21-0.23	Low------	3.0-4.0	0.28	0.28	5	6	48
	14-20	20-30	1.25-1.35	0.60-2.00	0.19-0.21	Low------	1.0-2.0	0.43	0.43			
	20-36	20-27	1.25-1.35	0.60-2.00	0.19-0.21	Low------	0.0-1.0	0.43	0.43			
	36-60	12-25	1.25-1.40	0.60-2.00	0.20-0.22	Low------	0.0-1.0	0.43	0.43			
945:												
Albaton---------	0-60	45-70	1.20-1.30	0.01-0.06	0.11-0.14	Very high	2.0-3.0	0.28	0.28	5	8	---
946:												
Albaton---------	0-60	45-70	1.20-1.30	0.01-0.06	0.11-0.14	Very high	2.0-3.0	0.28	0.28	5	8	---
1137:												
Haynie----------	0-7	15-25	1.20-1.35	0.60-2.00	0.18-0.23	Low------	1.0-3.0	0.32	0.32	5	4L	86
	7-60	15-18	1.20-1.35	0.60-2.00	0.18-0.23	Low------	0.0-1.0	0.43	0.43			

Table 22.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
1144:												
Blake-----------	0-7	27-38	1.25-1.30	0.60-2.00	0.20-0.22	Moderate	1.0-3.0	0.32	0.32	5	4L	86
	7-26	22-35	1.25-1.30	0.60-2.00	0.20-0.22	Moderate	0.0-1.0	0.43	0.43			
	26-60	10-20	1.30-1.35	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
1145:												
Onawa-----------	0-8	15-22	1.20-1.25	0.60-2.00	0.22-0.24	Low------	1.0-2.0	0.37	0.37	5	4L	86
	8-22	50-60	1.30-1.40	0.06-0.20	0.12-0.14	High-----	0.0-1.0	0.28	0.28			
	22-60	12-18	1.40-1.50	0.60-6.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
1146:												
Onawa-----------	0-7	40-55	1.30-1.35	0.20-0.60	0.12-0.14	High-----	2.0-3.0	0.32	0.32	5	4	86
	7-23	50-60	1.30-1.40	0.06-0.20	0.12-0.14	High-----	0.0-1.0	0.28	0.28			
	23-60	12-18	1.40-1.50	0.60-6.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
1147:												
Modale----------	0-24	27-30	1.20-1.30	0.60-2.00	0.21-0.23	Moderate	1.0-3.0	0.37	0.37	5	4L	86
	24-60	50-60	1.35-1.45	0.00-0.20	0.11-0.13	High-----	0.5-1.0	0.28	0.28			
1150:												
Modale----------	0-24	10-18	1.20-1.30	0.60-2.00	0.21-0.23	Low------	1.0-3.0	0.37	0.37	5	4L	86
	24-60	50-60	1.35-1.45	0.00-0.20	0.11-0.13	High-----	0.5-1.0	0.28	0.28			
1155:												
Albaton---------	0-15	27-40	1.30-1.35	0.20-2.00	0.20-0.22	Moderate	2.0-3.0	0.37	0.37	5	4L	86
	15-60	50-60	1.35-1.45	0.01-0.06	0.11-0.13	Very high	0.0-1.0	0.28	0.28			
1156:												
Albaton---------	0-15	40-60	1.35-1.40	0.01-0.20	0.11-0.13	Very high	2.0-3.0	0.28	0.28	5	4	86
	15-60	50-60	1.35-1.45	0.01-0.06	0.11-0.13	Very high	0.0-1.0	0.28	0.28			
1157:												
Albaton---------	0-15	22-27	1.30-1.35	0.60-2.00	0.22-0.24	Moderate	1.0-2.0	0.37	0.37	5	4L	86
	15-60	50-60	1.35-1.45	0.01-0.06	0.11-0.13	Very high	0.0-1.0	0.28	0.28			
1220:												
Nodaway---------	0-8	18-27	1.25-1.35	0.60-2.00	0.20-0.23	Low------	2.0-3.0	0.32	0.32	5	6	48
	8-60	18-28	1.25-1.35	0.60-2.00	0.20-0.23	Moderate	0.0-0.5	0.43	0.43			
1237:												
Sarpy-----------	0-6	2-5	1.20-1.50	6.00-20.00	0.05-0.09	Low------	0.5-1.0	0.17	0.17	5	2	134
	6-60	2-5	1.20-1.50	6.00-20.00	0.05-0.09	Low------	0.5-1.0	0.15	0.15			
1237B:												
Sarpy-----------	0-6	2-5	1.20-1.50	6.00-20.00	0.05-0.09	Low------	0.5-1.0	0.17	0.17	5	2	134
	6-60	2-5	1.20-1.50	6.00-20.00	0.05-0.09	Low------	0.5-1.0	0.15	0.15			
1514:												
Grable----------	0-10	18-27	1.20-1.25	0.60-2.00	0.22-0.24	Low------	1.0-3.0	0.32	0.32	4	4L	86
	10-23	12-16	1.25-1.50	0.60-2.00	0.20-0.22	Low------	0.0-1.0	0.43	0.43			
	23-60	2-10	1.20-1.50	6.00-20.00	0.02-0.07	Low------	0.0-0.5	0.15	0.15			
1515:												
Percival--------	0-6	40-60	1.30-1.35	0.06-0.20	0.10-0.12	High-----	1.0-3.0	0.28	0.28	4	4	86
	6-23	40-60	1.30-1.35	0.06-0.20	0.10-0.12	High-----	0.0-2.0	0.28	0.28			
	23-60	2-12	1.30-1.50	6.00-20.00	0.02-0.04	Low------	0.0-0.5	0.15	0.15			
1516:												
Vore------------	0-24	28-35	1.30-1.35	0.60-2.00	0.19-0.22	Moderate	2.0-3.0	0.32	0.32	4	4L	86
	24-60	4-12	1.35-1.50	6.00-20.00	0.05-0.07	Low------	0.0-1.0	0.10	0.10			

Table 22.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors K	Kf	T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
1524:												
Morconick-------	0-7	10-20	1.20-1.25	0.60-2.00	0.20-0.22	Low------	1.0-3.0	0.32	0.32	3	4L	86
	7-13	12-25	1.25-1.50	0.60-2.00	0.20-0.22	Low------	0.0-1.0	0.43	0.43			
	13-57	2-10	1.50-1.70	6.00-2.00	0.02-0.07	Low------	0.0-0.5	0.15	0.15			
	57-80	2-15	1.25-1.50	6.00-20.00	0.02-0.07	Low------	0.0-0.5	0.15	0.15			
1525:												
Scroll----------	0-7	40-55	1.30-1.35	0.06-0.20	0.10-0.12	High-----	1.0-3.0	0.32	0.32	5	4	86
	7-11	18-27	1.30-1.35	0.60-2.00	0.20-0.22	Moderate	0.0-1.0	0.32	0.32			
	11-60	2-12	1.30-1.50	6.00-20.00	0.02-0.04	Low------	0.0-0.5	0.15	0.15			
1526:												
Scroll----------	0-8	27-40	1.30-1.35	0.20-0.60	0.19-0.22	Moderate	1.0-3.0	0.37	0.37	5	4	86
	8-12	18-27	1.30-1.35	0.60-2.00	0.20-0.22	Moderate	0.0-1.0	0.32	0.32			
	12-60	2-12	1.30-1.50	6.00-20.00	0.02-0.04	Low------	0.0-0.5	0.15	0.15			
1552:												
Owego-----------	0-8	40-50	1.30-1.35	0.00-0.06	0.12-0.14	High-----	2.0-4.0	0.32	0.32	5	4	86
	8-30	15-30	1.30-1.40	0.60-2.00	0.20-0.22	Moderate	0.0-1.0	0.37	0.37			
	30-60	48-58	1.35-1.45	0.00-0.06	0.11-0.13	High-----	0.0-0.5	0.32	0.32			
1746:												
Lossing---------	0-6	40-60	1.30-1.35	0.06-0.20	0.12-0.14	High-----	2.0-3.0	0.28	0.28	5	4	86
	6-10	40-55	1.30-1.40	0.06-0.20	0.12-0.14	High-----	1.0-2.0	0.28	0.28			
	10-14	27-35	1.25-1.30	0.20-0.60	0.20-0.22	High-----	0.0-1.0	0.32	0.32			
	14-71	15-24	1.40-1.50	0.60-6.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
	71-89	2-10	1.20-1.50	6.00-2.00	0.02-0.07	Low------	0.0-0.5	0.43	0.43			
1747:												
Rodney----------	0-9	40-60	1.30-1.35	0.06-0.20	0.12-0.14	High-----	3.0-4.0	0.28	0.28	5	4	86
	9-28	14-26	1.30-1.40	0.60-6.00	0.20-0.22	Low------	0.5-2.0	0.43	0.43			
	28-60	40-65	1.35-1.45	0.06-0.20	0.12-0.14	High-----	0.0-2.0	0.32	0.32			
1750:												
Ticonic---------	0-8	2-5	1.20-1.50	6.00-20.00	0.05-0.09	Low------	0.5-1.0	0.15	0.15	5	1	220
	8-28	2-5	1.20-1.50	6.00-20.00	0.05-0.09	Low------	0.0-0.5	0.15	0.15			
	28-52	12-24	1.35-1.50	0.60-2.00	0.20-0.22	Low------	0.0-0.5	0.24	0.24			
	52-72	6-18	1.35-1.60	2.00-6.00	0.11-0.17	Low------	0.0-0.5	0.10	0.10			
	72-80	24-60	1.30-1.50	0.06-2.00	0.14-0.20	High-----	0.0-0.5	0.43	0.43			
1849:												
Kenmoor---------	0-7	10-20	1.40-1.50	2.00-6.00	0.13-0.16	Low------	0.5-1.0	0.24	0.24	5	3	86
	7-33	5-10	1.50-1.60	6.00-20.00	0.05-0.12	Low------	---	0.17	0.17			
	33-60	35-60	1.30-1.50	0.06-0.20	0.12-0.19	High-----	---	0.32	0.32			
5010:												
Pits------------	0-60	0-2	---	---	---	---	---	---	---	---	---	---
5040:												
Orthents--------	0-60	2-18	1.50-1.70	0.60-2.00	0.08-0.14	Low------	---	0.24	---	5	3	86
	60-80	---	---	0.06-2.00	---	---	---	---	---			
5044:												
Fluvaquents.												
5045:												
Aquents---------	0-40	---	---	0.60-6.00	---	---	---	---	---	---	8	---
5046, 5047:												
Aquents---------	0-40	---	---	0.60-6.00	---	---	---	---	---	5	8	---

Table 22.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in		Pct					
5051:												
Fluvaquents-----	0-60	---	---	---	---	---	---	---	---	---	8	---
	60-80	---	---	---	---	---	---	---	---			
5090:												
Aquents---------	0-40	---	---	0.60-6.00	---	---	---	---	---	---	8	---
Orthents.												

Table 23.--Chemical Properties of the Soils

(Absence of an entry indicates that data were not estimated)

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
1C:								
Ida-------------	0-8	18-25	20.0-25.0	6.6-8.4	0-25	---	---	---
	8-60	18-25	20.0-25.0	7.4-8.4	5-30	---	---	---
1C3:								
Ida-------------	0-8	18-25	20.0-25.0	6.6-8.4	0-25	---	---	---
	8-60	18-25	20.0-25.0	7.4-8.4	5-30	---	---	---
1D:								
Ida-------------	0-8	18-25	20.0-25.0	6.6-8.4	0-25	---	---	---
	8-60	18-25	20.0-25.0	7.4-8.4	5-30	---	---	---
1D3:								
Ida-------------	0-8	18-25	20.0-25.0	6.6-8.4	0-25	---	---	---
	8-60	18-25	20.0-25.0	7.4-8.4	5-30	---	---	---
1E:								
Ida-------------	0-8	18-25	20.0-25.0	6.6-8.4	0-25	---	---	---
	8-60	18-25	20.0-25.0	7.4-8.4	5-30	---	---	---
1E3:								
Ida-------------	0-8	18-25	20.0-25.0	6.6-8.4	0-25	---	---	---
	8-60	18-25	20.0-25.0	7.4-8.4	5-30	---	---	---
1F:								
Ida-------------	0-8	18-25	20.0-25.0	6.6-8.4	0-25	---	---	---
	8-60	18-25	20.0-25.0	7.4-8.4	5-30	---	---	---
1F3:								
Ida-------------	0-8	18-25	20.0-25.0	6.6-8.4	0-25	---	---	---
	8-60	18-25	20.0-25.0	7.4-8.4	5-30	---	---	---
1G:								
Ida-------------	0-8	18-25	20.0-25.0	6.6-8.4	0-25	---	---	---
	8-60	18-25	20.0-25.0	7.4-8.4	5-30	---	---	---
2G:								
Hamburg---------	0-4	6-12	5.0-15.0	6.6-8.4	0-25	---	---	---
	4-60	6-12	5.0-15.0	7.4-8.4	5-30	---	---	---
3D:								
Castana---------	0-18	18-22	20.0-25.0	7.4-8.4	5-30	---	---	---
	18-60	18-24	20.0-25.0	7.4-8.4	5-30	---	---	---
3E:								
Castana---------	0-14	18-22	20.0-25.0	7.4-8.4	5-30	---	---	---
	14-60	18-24	20.0-25.0	7.4-8.4	5-30	---	---	---
3F:								
Castana---------	0-14	18-22	20.0-25.0	7.4-8.4	5-30	---	---	---
	14-60	18-24	20.0-25.0	7.4-8.4	5-30	---	---	---
10B:								
Monona----------	0-14	20-27	25.0-30.0	5.6-7.3	---	---	---	---
	14-54	24-28	25.0-30.0	6.1-7.3	---	---	---	---
	54-60	18-24	20.0-25.0	6.6-8.4	0-25	---	---	---

Table 23.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
10C:								
Monona----------	0-14	20-27	25.0-30.0	5.6-7.3	---	---	---	---
	14-54	24-28	25.0-30.0	6.1-7.3	---	---	---	---
	54-60	18-24	20.0-25.0	6.6-8.4	0-25	---	---	---
10C2:								
Monona----------	0-8	20-27	25.0-30.0	5.6-7.3	---	---	---	---
	8-30	24-28	25.0-30.0	6.1-7.3	---	---	---	---
	30-60	18-24	25.0-30.0	6.6-8.4	0-25	---	---	---
10C3:								
Monona----------	0-8	20-27	25.0-30.0	5.6-7.3	---	---	---	---
	8-30	24-28	25.0-30.0	6.1-7.3	---	---	---	---
	30-60	18-24	20.0-25.0	6.6-8.4	0-25	---	---	---
10D:								
Monona----------	0-14	20-27	25.0-30.0	5.6-7.3	---	---	---	---
	14-54	24-28	25.0-30.0	6.1-7.3	---	---	---	---
	54-60	18-24	20.0-25.0	6.6-8.4	0-25	---	---	---
10D2:								
Monona----------	0-8	20-27	25.0-30.0	5.6-7.3	---	---	---	---
	8-30	24-28	25.0-30.0	6.1-7.3	---	---	---	---
	30-60	18-24	25.0-30.0	6.6-8.4	0-25	---	---	---
10D3:								
Monona----------	0-8	20-27	25.0-30.0	5.6-7.3	---	---	---	---
	8-30	24-28	25.0-30.0	6.1-7.3	---	---	---	---
	30-60	18-24	20.0-25.0	6.6-8.4	0-25	---	---	---
10E:								
Monona----------	0-14	20-27	25.0-30.0	5.6-7.3	---	---	---	---
	14-54	24-28	25.0-30.0	6.1-7.3	---	---	---	---
	54-60	18-24	20.0-25.0	6.6-8.4	0-25	---	---	---
10E2:								
Monona----------	0-8	20-27	25.0-30.0	5.6-7.3	---	---	---	---
	8-30	24-28	25.0-30.0	6.1-7.3	---	---	---	---
	30-60	18-24	25.0-30.0	6.6-8.4	0-25	---	---	---
10E3:								
Monona----------	0-8	20-27	25.0-30.0	5.6-7.3	---	---	---	---
	8-30	24-28	25.0-30.0	6.1-7.3	---	---	---	---
	30-60	18-24	20.0-25.0	6.6-8.4	0-25	---	---	---
10F:								
Monona----------	0-14	20-27	25.0-30.0	5.6-7.3	---	---	---	---
	14-54	24-28	25.0-30.0	6.1-7.3	---	---	---	---
	54-60	18-24	20.0-25.0	6.6-8.4	0-25	---	---	---
10F2:								
Monona----------	0-8	20-27	25.0-30.0	5.6-7.3	---	---	---	---
	8-30	24-28	25.0-30.0	6.1-7.3	---	---	---	---
	30-60	18-24	25.0-30.0	6.6-8.4	0-25	---	---	---
10F3:								
Monona----------	0-8	20-27	25.0-30.0	5.6-7.3	---	---	---	---
	8-30	24-28	25.0-30.0	6.1-7.3	---	---	---	---
	30-60	18-24	20.0-25.0	6.6-8.4	0-25	---	---	---

Table 23.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
10G:								
Monona----------	0-14	20-27	25.0-30.0	5.6-7.3	---	---	---	---
	14-54	24-28	25.0-30.0	6.1-7.3	---	---	---	---
	54-60	18-24	20.0-25.0	6.6-8.4	0-25	---	---	---
12B:								
Napier----------	0-28	20-27	20.0-25.0	6.1-7.3	---	---	---	---
	28-60	20-27	20.0-25.0	6.1-8.4	0-10	---	---	---
12C:								
Napier----------	0-28	20-27	20.0-25.0	6.1-7.3	---	---	---	---
	28-60	20-27	20.0-25.0	6.1-8.4	0-10	---	---	---
12D:								
Napier----------	0-28	20-27	20.0-25.0	6.1-7.3	---	---	---	---
	28-60	20-27	20.0-25.0	6.1-8.4	0-10	---	---	---
17B:								
Napier----------	0-28	20-27	20.0-25.0	6.1-7.3	---	---	---	---
	28-60	20-27	20.0-25.0	6.1-8.4	0-10	---	---	---
Kennebec--------	0-48	22-27	30.0-36.0	5.6-7.3	---	---	---	---
	48-60	24-28	30.0-36.0	6.1-7.3	---	---	---	---
Colo------------	0-16	27-36	36.0-41.0	5.6-7.3	---	---	---	---
	16-40	30-35	36.0-41.0	5.6-7.3	---	---	---	---
	40-60	25-35	30.0-36.0	6.1-7.3	---	---	---	---
33D:								
Steinauer-------	0-6	27-32	15.0-25.0	7.4-8.4	1-10	---	---	---
	6-12	27-32	15.0-25.0	7.9-8.4	1-15	---	---	---
	12-60	24-35	15.0-25.0	7.9-8.4	1-15	---	---	---
33E:								
Steinauer-------	0-6	27-32	15.0-25.0	7.4-8.4	1-10	---	---	---
	6-12	27-32	15.0-25.0	7.9-8.4	1-15	---	---	---
	12-60	24-35	15.0-25.0	7.9-8.4	1-15	---	---	---
33F:								
Steinauer-------	0-6	27-32	15.0-25.0	7.4-8.4	1-10	---	---	---
	6-12	27-32	15.0-25.0	7.9-8.4	1-15	---	---	---
	12-60	24-35	15.0-25.0	7.9-8.4	1-15	---	---	---
33G:								
Steinauer-------	0-6	27-32	15.0-25.0	7.4-8.4	1-10	---	---	---
	6-12	27-32	15.0-25.0	7.9-8.4	1-15	---	---	---
	12-60	24-35	15.0-25.0	7.9-8.4	1-15	---	---	---
36:								
Salix-----------	0-17	27-30	30.0-36.0	6.1-7.8	0-15	---	---	---
	17-23	28-38	25.0-30.0	6.1-7.8	0-15	---	---	---
	23-60	16-22	15.0-20.0	6.6-8.4	0-30	---	---	---
44:								
Blencoe---------	0-27	40-55	41.0-50.0	6.1-7.3	---	---	---	---
	27-33	35-50	41.0-50.0	6.6-7.8	0-20	---	---	---
	33-60	18-24	20.0-25.0	7.4-8.4	5-30	---	---	---
46:								
Keg-------------	0-17	20-26	25.0-30.0	6.1-7.3	---	---	---	---
	17-60	18-22	20.0-25.0	7.4-8.4	5-30	---	---	---

Table 23.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
54:								
Zook------------	0-30	35-40	36.0-41.0	5.6-7.3	---	---	---	---
	30-40	36-45	36.0-41.0	5.6-7.8	---	---	---	---
	40-60	20-45	30.0-36.0	5.6-7.8	---	---	---	---
54+:								
Zook------------	0-15	20-26	20.0-25.0	5.6-7.3	---	---	---	---
	15-45	36-45	36.0-41.0	5.6-7.8	---	---	---	---
	45-60	20-45	30.0-36.0	5.6-7.8	---	---	---	---
66:								
Luton-----------	0-14	40-60	41-50.0	6.6-7.8	---	---	---	---
	14-30	60-70	41-50.0	6.6-7.8	0-15	---	---	---
	30-60	60-70	41-50.0	6.6-8.4	0-25	---	---	---
66+:								
Luton-----------	0-9	20-27	20.0-25.0	6.6-7.8	---	---	---	---
	9-22	60-70	41-50.0	6.6-7.8	0-15	---	---	---
	22-80	60-70	41-50.0	6.6-8.4	0-25	---	---	---
67:								
Woodbury--------	0-24	40-55	41.0-50.0	6.1-7.3	---	---	---	---
	24-36	40-50	41.0-45.0	6.1-6.5	---	---	---	---
	36-60	28-35	35.0-41.0	6.6-7.8	0-2	---	---	---
68:								
Napa------------	0-1	27-40	25.0-35.0	6.6-8.4	0-25	0-25	0-2	0-5
	1-30	45-60	30.0-45.0	7.4-9.0	0-5	1-5	4-16	5-18
	30-60	35-50	30.0-45.0	7.4-9.0	5-15	1-10	2-8	0-10
70:								
McPaul----------	0-60	10-18	15.0-20.0	7.4-8.4	5-30	---	---	---
123:								
Grantcenter-----	0-23	24-32	30.0-36.0	5.6-7.3	---	---	---	---
	23-56	15-30	25.0-30.0	6.1-7.8	0-10	---	---	---
	56-60	14-26	15.0-20.0	6.6-7.8	0-10	---	---	---
133:								
Colo------------	0-16	27-36	36.0-41.0	5.6-7.3	---	---	---	---
	16-40	30-35	36.0-41.0	5.6-7.3	---	---	---	---
	40-60	25-35	30.0-36.0	6.1-7.3	---	---	---	---
133+:								
Colo------------	0-16	20-26	25.0-30.0	5.6-7.3	---	---	---	---
	16-40	30-35	36.0-41.0	5.6-7.3	---	---	---	---
	40-60	25-35	30.0-36.0	6.1-7.3	---	---	---	---
137:								
Haynie----------	0-7	15-25	15.0-20.0	6.6-8.4	0-25	---	---	---
	7-60	15-18	15.0-20.0	7.4-8.4	5-30	---	---	---
144:								
Blake-----------	0-7	27-38	25.0-35.0	7.4-8.4	5-30	---	---	---
	7-26	22-35	20.0-30.0	7.4-8.4	5-30	---	---	---
	26-60	10-20	10.0-20.0	7.4-8.4	5-30	---	---	---
145:								
Onawa-----------	0-7	15-22	15.0-20.0	7.4-8.4	5-30	---	---	---
	7-23	50-60	41.0-50.0	7.4-8.4	5-30	---	---	---
	23-60	12-18	15.0-20.0	7.4-8.4	5-30	---	---	---

Table 23.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
146:								
Onawa-----------	0-7	40-55	36.0-41.0	7.4-8.4	5-30	---	---	---
	7-23	50-60	41.0-50.0	7.4-8.4	5-30	---	---	---
	23-60	12-18	15.0-20.0	7.4-8.4	5-30	---	---	---
147:								
Modale----------	0-24	27-30	15.0-20.0	7.4-8.4	5-30	---	---	---
	24-60	50-60	41.0-55.0	7.4-8.4	5-30	---	---	---
149:								
Modale----------	0-24	10-18	15.0-20.0	7.4-8.4	5-30	---	---	---
	24-60	50-60	41.0-55.0	7.4-8.4	5-30	---	---	---
155:								
Albaton---------	0-15	27-40	25.0-30.0	7.4-8.4	5-30	---	---	---
	15-60	50-70	41.0-50.0	7.4-8.4	5-30	---	---	---
156:								
Albaton---------	0-15	40-60	36.0-41.0	7.4-8.4	5-30	---	---	---
	15-60	50-70	41.0-50.0	7.4-8.4	5-30	---	---	---
157:								
Albaton---------	0-15	22-27	20.0-25.0	7.4-8.4	5-30	---	---	---
	15-60	50-70	41.0-50.0	7.4-8.4	5-30	---	---	---
212:								
Kennebec--------	0-48	22-27	30.0-36.0	5.6-7.3	---	---	---	---
	48-60	24-28	30.0-36.0	6.1-7.3	---	---	---	---
212+:								
Kennebec--------	0-18	22-27	30.0-36.0	5.6-7.3	---	---	---	---
	18-60	24-28	30.0-36.0	6.1-7.3	---	---	---	---
220:								
Nodaway---------	0-8	18-27	20.0-25.0	6.1-7.3	---	---	---	---
	8-60	18-28	20.0-25.0	6.1-7.3	---	---	---	---
234:								
Nishna----------	0-30	36-40	41.0-45.0	7.4-8.4	5-30	---	---	---
	30-60	38-46	30.0-36.0	7.4-8.4	5-30	---	---	---
237:								
Sarpy-----------	0-6	2-5	2.0-8.0	6.6-8.4	0-15	---	---	---
	6-60	2-5	2.0-8.0	6.6-8.4	0-15	---	---	---
237B:								
Sarpy-----------	0-6	2-5	2.0-8.0	6.6-8.4	0-15	---	---	---
	6-60	2-5	2.0-8.0	6.6-8.4	0-15	---	---	---
244:								
Blend-----------	0-20	40-60	41.0-50.0	5.6-7.3	---	---	---	---
	20-31	30-40	36.0-41.0	6.1-7.8	0-20	---	---	---
	31-60	40-60	41.0-50.0	6.1-7.8	0-20	---	---	---
255:								
Cooper----------	0-12	27-34	25.0-30.0	6.1-7.8	0-15	---	---	---
	12-25	27-34	25.0-30.0	6.6-8.4	0-25	---	---	---
	25-60	40-60	41.0-50.0	6.6-8.4	0-25	---	---	---
257:								
Uturin----------	0-25	20-27	20.0-25.0	7.4-8.4	0-10	---	---	---
	25-80	35-46	30.0-36.0	7.4-8.4	5-30	---	---	---

Table 23.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
266:								
Smithland-------	0-16	27-36	36.0-41.0	5.6-7.3	---	---	---	---
	16-40	30-35	36.0-41.0	5.6-7.3	---	---	---	---
	40-60	25-35	30.0-36.0	6.1-7.3	---	---	---	---
275:								
Moville---------	0-29	10-18	15.0-20.0	7.4-8.4	---	---	---	---
	29-60	50-60	41.0-55.0	6.6-7.8	---	---	---	---
366:								
Luton-----------	0-14	35-40	41-50.0	6.6-7.8	---	---	---	---
	14-25	60-70	41-50.0	6.6-7.8	0-15	---	---	---
	25-60	60-70	41-50.0	6.6-8.4	0-25	---	---	---
430:								
Ackmore---------	0-10	18-27	25.0-30.0	5.6-7.3	---	---	---	---
	10-23	18-30	25.0-30.0	5.6-7.3	---	---	---	---
	23-60	26-38	25.0-30.0	5.6-7.8	5-10	---	---	---
436:								
Lakeport--------	0-10	32-38	30.0-36.0	6.1-7.3	---	---	---	---
	10-26	35-38	25.0-30.0	6.1-7.3	---	---	---	---
	26-47	35-42	25.0-30.0	6.6-7.8	0-15	---	---	---
	47-60	18-30	20.0-25.0	7.4-8.4	5-30	---	---	---
446:								
Burcham---------	0-25	18-27	20.0-25.0	6.6-8.4	0-25	---	---	---
	25-60	40-50	36.0-45.0	7.4-8.4	5-30	---	---	---
465:								
Tieville--------	0-22	40-60	30.0-50.0	7.4-8.4	5-15	---	---	---
	22-60	40-70	30.0-50.0	7.9-9.0	12-30	---	---	---
510:								
Monona----------	0-14	20-27	25.0-30.0	5.6-7.3	---	---	---	---
	14-54	24-28	25.0-30.0	6.1-7.3	---	---	---	---
	54-60	18-24	20.0-25.0	6.6-8.4	0-25	---	---	---
510B:								
Monona----------	0-14	20-27	25.0-30.0	5.6-7.3	---	---	---	---
	14-54	24-28	25.0-30.0	6.1-7.3	---	---	---	---
	54-60	18-24	20.0-25.0	6.6-8.4	0-25	---	---	---
510C:								
Monona----------	0-14	20-27	25.0-30.0	5.6-7.3	---	---	---	---
	14-54	24-28	25.0-30.0	6.1-7.3	---	---	---	---
	54-60	18-24	20.0-25.0	6.6-8.4	0-25	---	---	---
510C2:								
Monona----------	0-8	20-27	25.0-30.0	5.6-7.3	---	---	---	---
	8-30	24-28	25.0-30.0	6.1-7.3	---	---	---	---
	30-60	18-24	25.0-30.0	6.6-8.4	0-25	---	---	---
510C3:								
Monona----------	0-8	20-27	25.0-30.0	5.6-7.3	---	---	---	---
	8-30	24-28	25.0-30.0	6.1-7.3	---	---	---	---
	30-60	18-24	20.0-25.0	6.6-8.4	0-25	---	---	---
514:								
Grable----------	0-10	18-27	15.0-20.0	7.4-8.4	5-30	---	---	---
	10-23	12-16	15.0-20.0	7.4-8.4	5-30	---	---	---
	23-60	2-10	5.0-10.0	7.4-8.4	5-30	---	---	---

Table 23.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
515:								
Percival--------	0-6	40-60	36.0-41.0	7.4-8.4	0-15	---	---	---
	6-23	40-60	35.0-40.0	7.4-8.4	0-25	---	---	---
	23-60	2-12	5.0-15.0	7.4-8.4	0-25	---	---	---
516:								
Vore------------	0-24	28-35	25.0-30.0	7.4-8.4	5-30	---	---	---
	24-60	4-12	5.0-10.0	7.4-8.4	5-30	---	---	---
552:								
Owego-----------	0-17	40-50	36.0-41.0	6.6-7.8	0-15	---	---	---
	17-25	15-30	30.0-36.0	7.4-8.4	5-30	---	---	---
	25-60	48-58	41.0-50.0	7.4-8.4	5-30	---	---	---
553:								
Forney----------	0-15	40-60	36.0-41.0	6.1-7.8	0-15	---	---	---
	15-60	50-60	41.0-50.0	6.1-7.8	0-15	---	---	---
670:								
Rawles----------	0-28	18-27	15.0-20.0	6.6-8.4	0-30	---	---	---
	28-60	22-35	15.0-20.0	6.1-7.8	0-20	---	---	---
717D:								
Napier----------	0-28	20-27	20.0-25.0	6.1-7.3	---	---	---	---
	28-60	20-27	20.0-25.0	6.1-8.4	0-10	---	---	---
Gullied land.								
746:								
Lossing---------	0-6	40-60	36.0-41.0	6.6-7.8	0-3	---	---	---
	6-10	40-55	41.0-50.0	7.4-8.4	0-5	---	---	---
	10-14	27-35	36.0-41.0	7.4-8.4	2-5	---	---	---
	14-71	15-24	15.0-20.0	7.4-8.4	2-10	---	---	---
	71-80	2-10	4.0-20.0	7.4-8.4	2-5	---	---	---
747:								
Rodney----------	0-9	40-60	36.0-41.0	6.6-7.8	0-5	---	---	---
	9-28	14-26	30.0-36.0	7.4-8.4	0-10	---	---	---
	28-60	40-65	41.0-50.0	7.4-8.4	0-10	---	---	---
748:								
Hornick---------	0-9	40-50	36.0-41.0	6.1-7.3	---	---	---	---
	9-19	20-27	25.0-30.0	6.6-8.4	0-2	---	---	---
	19-30	20-27	25.0-30.0	6.6-8.4	0-15	---	---	---
	30-80	40-55	25.0-30.0	7.4-8.4	2-25	---	---	---
754:								
Larpenteur------	0-14	20-30	30.0-36.0	6.6-8.4	0-10	---	---	---
	14-20	20-30	15.0-20.0	7.4-8.4	5-15	---	---	---
	20-36	20-27	15.0-20.0	7.4-8.4	2-10	---	---	---
	36-60	12-25	15.0-20.0	7.4-8.4	2-10	---	---	---
945:								
Albaton---------	0-60	45-70	36.0-41.0	7.4-8.4	5-30	---	---	---
946:								
Albaton---------	0-60	45-70	36.0-41.0	7.4-8.4	5-30	---	---	---
1137:								
Haynie----------	0-7	15-25	15.0-20.0	6.6-8.4	0-25	---	---	---
	7-60	15-18	15.0-20.0	7.4-8.4	5-30	---	---	---

Table 23.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
1144:								
Blake-----------	0-7	27-38	25.0-35.0	7.4-8.4	5-30	---	---	---
	7-26	22-35	20.0-30.0	7.4-8.4	5-30	---	---	---
	26-60	10-20	10.0-20.0	7.4-8.4	5-30	---	---	---
1145:								
Onawa-----------	0-8	15-22	15.0-20.0	7.4-8.4	5-30	---	---	---
	8-22	50-60	41.0-50.0	7.4-8.4	5-30	---	---	---
	22-60	12-18	15.0-20.0	7.4-8.4	5-30	---	---	---
1146:								
Onawa-----------	0-7	40-55	36.0-41.0	7.4-8.4	5-30	---	---	---
	7-23	50-60	41.0-50.0	7.4-8.4	5-30	---	---	---
	23-60	12-18	15.0-20.0	7.4-8.4	5-30	---	---	---
1147:								
Modale----------	0-24	27-30	15.0-20.0	7.4-8.4	5-30	---	---	---
	24-60	50-60	41.0-55.0	7.4-8.4	5-30	---	---	---
1150:								
Modale----------	0-24	10-18	15.0-20.0	7.4-8.4	5-30	---	---	---
	24-60	50-60	41.0-55.0	7.4-8.4	5-30	---	---	---
1155:								
Albaton---------	0-15	27-40	25.0-30.0	7.4-8.4	5-30	---	---	---
	15-60	50-60	41.0-50.0	7.4-8.4	5-30	---	---	---
1156:								
Albaton---------	0-15	40-60	36.0-41.0	7.4-8.4	5-30	---	---	---
	15-60	50-60	41.0-50.0	7.4-8.4	5-30	---	---	---
1157:								
Albaton---------	0-15	22-27	20.0-25.0	7.4-8.4	5-30	---	---	---
	15-60	50-60	41.0-50.0	7.4-8.4	5-30	---	---	---
1220:								
Nodaway---------	0-8	18-27	20.0-25.0	6.1-7.3	---	---	---	---
	8-60	18-28	20.0-25.0	6.1-7.3	---	---	---	---
1237:								
Sarpy-----------	0-6	2-5	2.0-6.0	6.6-8.4	1-2	---	---	---
	6-60	2-5	2.0-6.0	6.6-8.4	1-2	---	---	---
1237B:								
Sarpy-----------	0-6	2-5	2.0-6.0	6.6-8.4	1-2	---	---	---
	6-60	2-5	2.0-6.0	6.6-8.4	1-2	---	---	---
1514:								
Grable----------	0-10	18-27	15.0-20.0	7.4-8.4	5-30	---	---	---
	10-23	12-16	15.0-20.0	7.4-8.4	5-30	---	---	---
	23-60	2-10	5.0-10.0	7.4-8.4	5-30	---	---	---
1515:								
Percival--------	0-6	40-60	36.0-41.0	7.4-8.4	0-15	---	---	---
	6-23	40-60	35.0-40.0	7.4-8.4	0-25	---	---	---
	23-60	2-12	5.0-15.0	7.4-8.4	0-25	---	---	---
1516:								
Vore------------	0-24	28-35	25.0-30.0	7.4-8.4	5-30	---	---	---
	24-60	4-12	5.0-10.0	7.4-8.4	5-30	---	---	---

Table 23.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
1524:								
Morconick-------	0-7	10-20	5.0-10.0	7.4-8.4	1-5	---	---	---
	7-13	12-25	15.0-20.0	7.4-8.4	1-5	---	---	---
	13-57	2-10	2.0-10.0	7.4-8.4	1-5	---	---	---
	57-80	2-15	1.0-5.0	7.4-8.4	1-5	---	---	---
1525:								
Scroll----------	0-7	40-55	36.0-41.0	7.4-8.4	0-15	---	---	---
	7-11	18-27	25.0-30.0	7.4-8.4	1-25	---	---	---
	11-60	2-12	5.0-15.0	7.4-8.4	1-25	---	---	---
1526:								
Scroll----------	0-8	27-40	25.0-30.0	7.4-8.4	0-15	---	---	---
	8-12	18-27	25.0-30.0	7.4-8.4	1-25	---	---	---
	12-60	2-12	5.0-15.0	7.4-8.4	1-25	---	---	---
1552:								
Owego-----------	0-8	40-50	36.0-41.0	6.6-7.8	0-15	---	---	---
	8-30	15-30	30.0-36.0	7.4-8.4	5-30	---	---	---
	30-60	48-58	41.0-50.0	7.4-8.4	5-30	---	---	---
1746:								
Lossing---------	0-6	40-60	36.0-41.0	6.6-7.8	0-3	---	---	---
	6-10	40-55	41.0-50.0	7.4-8.4	0-5	---	---	---
	10-14	27-35	36.0-41.0	7.4-8.4	2-5	---	---	---
	14-71	15-24	15.0-20.0	7.4-8.4	2-10	---	---	---
	71-89	2-10	4.0-20.0	7.4-8.4	2-5	---	---	---
1747:								
Rodney----------	0-9	40-60	36.0-41.0	6.6-7.8	0-5	---	---	---
	9-28	14-26	30.0-36.0	7.4-8.4	0-10	---	---	---
	28-60	40-65	41.0-50.0	7.4-8.4	0-10	---	---	---
1750:								
Ticonic---------	0-8	2-5	2.0-6.0	6.6-8.4	0-5	---	---	---
	8-28	2-5	2.0-6.0	6.6-8.4	0-5	---	---	---
	28-52	12-24	10.0-20.0	7.4-8.4	0-15	---	---	---
	52-72	6-18	4.0-20.0	7.4-8.4	0-20	---	---	---
	72-80	24-60	20.0-36.0	7.4-8.4	0-20	---	---	---
1849:								
Kenmoor---------	0-7	10-20	2.0-8.0	6.6-8.4	1-2	---	---	---
	7-33	5-10	2.0-8.0	7.4-8.4	1-2	---	---	---
	33-60	35-60	18.0-28.0	7.4-8.4	1-2	---	---	---
5010:								
Pits------------	0-60	---	---	---	---	---	---	---
5040:								
Orthents--------	0-60	2-18	---	---	---	---	---	---
	60-80	---	---	---	---	---	---	---
5044:								
Fluvaquents.								
5045, 5046, 5047:								
Aquents---------	0-40	---	---	---	---	---	---	---

Table 23.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
5051:								
Fluvaquents-----	0-60	18-35	---	---	---	---	---	---
	60-80	---	---	---	---	---	---	---
5090:								
Aquents---------	0-40	---	---	---	---	---	---	---
Orthents.								

Table 24.--Water Features

(See text for definitions of terms used in this table. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Map symbol and soil name	Hydro-logic group	Flooding			High water table and ponding				
		Frequency	Duration	Months	Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
1C:									
Ida	B	None	---	---	>6.0	---	---	---	---
1C3:									
Ida	B	None	---	---	>6.0	---	---	---	---
1D:									
Ida	B	None	---	---	>6.0	---	---	---	---
1D3:									
Ida	B	None	---	---	>6.0	---	---	---	---
1E:									
Ida	B	None	---	---	>6.0	---	---	---	---
1E3:									
Ida	B	None	---	---	>6.0	---	---	---	---
1F:									
Ida	B	None	---	---	>6.0	---	---	---	---
1F3:									
Ida	B	None	---	---	>6.0	---	---	---	---
1G:									
Ida	B	None	---	---	>6.0	---	---	---	---
2G:									
Hamburg	B	None	---	---	>6.0	---	---	---	---
3D:									
Castana	B	None	---	---	>6.0	---	---	---	---
3E:									
Castana	B	None	---	---	>6.0	---	---	---	---
3F:									
Castana	B	None	---	---	>6.0	---	---	---	---
10B:									
Monona	B	None	---	---	>6.0	---	---	---	---
10C:									
Monona	B	None	---	---	>6.0	---	---	---	---
10C2:									
Monona	B	None	---	---	>6.0	---	---	---	---
10C3:									
Monona	B	None	---	---	>6.0	---	---	---	---
10D:									
Monona	B	None	---	---	>6.0	---	---	---	---
10D2:									
Monona	B	None	---	---	>6.0	---	---	---	---

Table 24.--Water Features--Continued

Map symbol and soil name	Hydro- logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table and ponding: Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
10D3:									
Monona	B	None	---	---	>6.0	---	---	---	---
10E:									
Monona	B	None	---	---	>6.0	---	---	---	---
10E2:									
Monona	B	None	---	---	>6.0	---	---	---	---
10E3:									
Monona	B	None	---	---	>6.0	---	---	---	---
10F:									
Monona	B	None	---	---	>6.0	---	---	---	---
10F2:									
Monona	B	None	---	---	>6.0	---	---	---	---
10F3:									
Monona	B	None	---	---	>6.0	---	---	---	---
10G:									
Monona	B	None	---	---	>6.0	---	---	---	---
12B:									
Napier	B	None	---	---	>6.0	---	---	---	---
12C:									
Napier	B	None	---	---	>6.0	---	---	---	---
12D:									
Napier	B	None	---	---	>6.0	---	---	---	---
17B:									
Napier	B	None	---	---	>6.0	---	---	---	---
Kennebec	B	None	---	---	3.0-5.0	Apparent	Nov-Jul	---	---
Colo	B/D	None	---	---	0.0-1.0	Apparent	Nov-Jul	---	---
33D:									
Steinauer	B	None	---	---	>6.0	---	---	---	---
33E:									
Steinauer	B	None	---	---	>6.0	---	---	---	---
33F:									
Steinauer	B	None	---	---	>6.0	---	---	---	---
33G:									
Steinauer	B	None	---	---	>6.0	---	---	---	---
36:									
Salix	B	Rare	---	---	4.0-6.0	Apparent	Nov-Jul	---	---
44:									
Blencoe	D	Rare	---	---	2.0-4.0	Apparent	Nov-Jul	---	---
46:									
Keg	B	Rare	---	---	>6.0	---	---	---	---

Table 24.--Water Features--Continued

Map symbol and soil name	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table and ponding: Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
54:									
Zook------------	C/D	Occasional	Long------	Feb-Nov	0.0-1.0	Apparent---	Nov-Jul	---	---
54+:									
Zook------------	C/D	Occasional	Long------	Feb-Nov	0.0-1.0	Apparent---	Nov-Jul	---	---
66:									
Luton-----------	D	Rare-------	---	---	0.0-1.0	Apparent---	Nov-Jul	---	---
66+:									
Luton-----------	D	Rare-------	---	---	0.0-1.0	Apparent---	Nov-Jul	---	---
67:									
Woodbury--------	D	Rare-------	---	---	0.0-1.0	Apparent---	Nov-Jul	---	---
68:									
Napa------------	D	Rare-------	---	---	0.0-3.0	Perched----	Nov-Jul	---	---
70:									
McPaul----------	B	Rare-------	---	---	>6.0	---	---	---	---
123:									
Grantcenter-----	B	Rare-------	---	---	2.0-4.0	Apparent---	Nov-Jul	---	---
133:									
Colo------------	B/D	Occasional	Long------	Feb-Nov	0.0-1.0	Apparent---	Nov-Jul	---	---
133+:									
Colo------------	B/D	Occasional	Long------	Feb-Nov	0.0-1.0	Apparent---	Nov-Jul	---	---
137:									
Haynie----------	B	Rare-------	---	---	>6.0	---	---	---	---
144:									
Blake-----------	B	Rare-------	---	---	2.0-4.0	Apparent---	Nov-Jul	---	---
145:									
Onawa-----------	D	Rare-------	---	---	2.0-4.0	Apparent---	Nov-Jul	---	---
146:									
Onawa-----------	D	Rare-------	---	---	2.0-4.0	Apparent---	Nov-Jul	---	---
147:									
Modale----------	C	Rare-------	---	---	1.5-3.0	Perched----	Nov-Jul	---	---
149:									
Modale----------	C	Rare-------	---	---	1.5-3.0	Perched----	Nov-Jul	---	---
155:									
Albaton---------	D	Rare-------	---	---	0.0-1.0	Apparent---	Nov-Jul	---	---
156:									
Albaton---------	D	Rare-------	---	---	0.0-1.0	Apparent---	Nov-Jul	---	---
157:									
Albaton---------	D	Rare-------	---	---	0.0-1.0	Apparent---	Nov-Jul	---	---
212:									
Kennebec--------	B	Occasional	Brief-----	Feb-Nov	3.0-5.0	Apparent---	Nov-Jul	---	---

Table 24.--Water Features--Continued

Map symbol and soil name	Hydro-logic group	Flooding			High water table and ponding				
		Frequency	Duration	Months	Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
212+:									
Kennebec--------	B	Occasional	Brief-----	Feb-Nov	3.0-5.0	Apparent---	Nov-Jul	---	---
220:									
Nodaway---------	B	Occasional	Brief-----	Feb-Nov	3.0-5.0	Apparent---	Nov-Jul	---	---
234:									
Nishna----------	C/D	Occasional	Brief-----	Feb-Nov	0.0-1.0	Apparent---	Nov-Jul	---	---
237:									
Sarpy-----------	A	Rare-------	---	---	>6.0	---	---	---	---
237B:									
Sarpy-----------	A	Rare-------	---	---	>6.0	---	---	---	---
244:									
Blend-----------	D	Rare-------	---	---	3.0-4.0	Apparent---	Nov-Jul	---	---
255:									
Cooper----------	B	Rare-------	---	---	1.5-2.5	Perched----	Nov-Jul	---	---
257:									
Uturin----------	C/D	Occasional	Brief-----	Feb-Nov	0.0-1.0	Apparent---	Nov-Jul	---	---
266:									
Smithland-------	B/D	Occasional	Long------	Feb-Nov	2.0-4.0	Apparent---	Nov-Jul	---	---
275:									
Moville---------	C	Rare-------	---	---	1.5-2.5	Perched----	Nov-Jul	---	---
366:									
Luton-----------	D	Rare-------	---	---	0.0-1.0	Apparent---	Nov-Jul	---	---
430:									
Ackmore---------	B	Occasional	Brief-----	Feb-Nov	2.0-4.0	Apparent---	Nov-Jul	---	---
436:									
Lakeport--------	B	Rare-------	---	---	2.0-4.0	Apparent---	Nov-Jul	---	---
446:									
Burcham---------	B	Rare-------	---	---	1.5-3.0	Perched----	Nov-Jun	---	---
465:									
Tieville--------	D	Rare-------	---	---	0.0-1.0	Apparent---	Nov-Jul	---	---
510:									
Monona----------	B	None-------	---	---	>6.0	---	---	---	---
510B:									
Monona----------	B	None-------	---	---	>6.0	---	---	---	---
510C:									
Monona----------	B	None-------	---	---	>6.0	---	---	---	---
510C2:									
Monona----------	B	None-------	---	---	>6.0	---	---	---	---
510C3:									
Monona----------	B	None-------	---	---	>6.0	---	---	---	---

Table 24.--Water Features--Continued

Map symbol and soil name	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
514:									
Grable	B	Rare	---	---	>6.0	---	---	---	---
515:									
Percival	C	Rare	---	---	2.0-4.0	Apparent	Nov-Jul	---	---
516:									
Vore	B	Rare	---	---	3.0-5.0	Apparent	Nov-Jul	---	---
552:									
Owego	D	Rare	---	---	0.0-1.0	Apparent	Nov-Jul	---	---
553:									
Forney	D	Rare	---	---	0.0-1.0	Apparent	Nov-Jul	---	---
670:									
Rawles	B	Occasional	Brief	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	---	---
717D:									
Napier	B	None	---	---	>6.0	---	---	---	---
Gullied land.									
746:									
Lossing	D	Rare	---	---	2.0-4.0	Apparent	Nov-Jul	---	---
747:									
Rodney	D	Rare	---	---	0.0-1.0	Apparent	Nov-Jul	---	---
748:									
Hornick	C	Rare	---	---	2.0-4.0	Apparent	Nov-Jul	---	---
754:									
Larpenteur	B	Rare	---	---	2.0-4.0	Apparent	Nov-Jul	---	---
945:									
Albaton	D	Frequent	Long	Feb-Nov	0.0-1.0	Apparent	Nov-Jun	Long	1.0
946:									
Albaton	D	Frequent	Long	Feb-Nov	0.0-1.0	Apparent	Nov-Jun	Very long	1.0
1137:									
Haynie	B	Occasional	Brief	Feb-Nov	>6.0	---	---	---	---
1144:									
Blake	B	Occasional	Long	Feb-Nov	2.0-4.0	Apparent	Nov-Jul	---	---
1145:									
Onawa	D	Occasional	Long	Feb-Nov	2.0-4.0	Apparent	Nov-Jul	---	---
1146:									
Onawa	D	Occasional	Long	Feb-Nov	2.0-4.0	Apparent	Nov-Jul	---	---
1147:									
Modale	C	Occasional	Brief	Feb-Nov	1.5-3.0	Perched	Nov-Jul	---	---
1150:									
Modale	C	Occasional	Brief	Feb-Nov	1.5-3.0	Perched	Nov-Jul	---	---
1155:									
Albaton	D	Occasional	Brief	Feb-Nov	0.0-1.0	Apparent	Nov-Jul	---	---

Table 24.--Water Features--Continued

Map symbol and soil name	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table and ponding: Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
1156:									
Albaton----------	D	Occasional	Brief-----	Feb-Nov	0.0-1.0	Apparent---	Nov-Jul	---	---
1157:									
Albaton----------	D	Occasional	Brief-----	Feb-Nov	0.0-1.0	Apparent---	Nov-Jul	---	---
1220:									
Nodaway----------	B	None-------	---	---	3.0-5.0	Apparent---	Nov-Jul	---	---
1237:									
Sarpy------------	A	Occasional	Long------	Feb-Nov	>6.0	---	---	---	---
1237B:									
Sarpy------------	A	Occasional	Long------	Feb-Nov	>6.0	---	---	---	---
1514:									
Grable-----------	B	Occasional	Brief-----	Feb-Nov	>6.0	---	---	---	---
1515:									
Percival---------	C	Occasional	Brief-----	Feb-Nov	2.0-4.0	Apparent---	Nov-Jul	---	---
1516:									
Vore-------------	B	Occasional	Brief-----	Feb-Nov	3.0-5.0	Apparent---	Nov-Jul	---	---
1524:									
Morconick--------	B	Occasional	Brief-----	Feb-Nov	>6.0	---	---	---	---
1525:									
Scroll-----------	C	Occasional	Brief-----	Feb-Nov	2.0-4.0	Apparent---	Nov-Jul	---	---
1526:									
Scroll-----------	C	Occasional	Brief-----	Feb-Nov	2.0-4.0	Apparent---	Nov-Jul	---	---
1552:									
Owego------------	D	Occasional	Brief-----	Feb-Nov	0.0-1.0	Apparent---	Nov-Jul	---	---
1746:									
Lossing----------	D	Occasional	Brief-----	Feb-Nov	2.0-4.0	Apparent---	Nov-Jul	---	---
1747:									
Rodney-----------	D	Occasional	Brief-----	Feb-Nov	0.0-1.0	Apparent---	Nov-Jul	---	---
1750:									
Ticonic----------	A	Occasional	Long------	Feb-Nov	>6.0	---	---	---	---
1849:									
Kenmoor----------	B	Occasional	Brief-----	Feb-Nov	2.0-3.0	Perched----	Nov-Jul	---	---
5010:									
Pits-------------	A	None-------	---	---	>6.0	---	---	---	---
5040:									
Orthents---------	---	None-------	---	---	>6.0	---	---	---	---
5044:									
Fluvaquents------	---	Frequent---	Very long	Feb-Nov	3.0-5.0	Apparent---	Nov-Jul	---	---
5045:									
Aquents----------	---	Rare-------	---	---	0.0-2.0	Apparent---	Nov-Jul	Very long	0.5

Table 24.--Water Features--Continued

Map symbol and soil name	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
5046:									
Aquents----------	---	Rare--------	---	---	0.0-1.0	Apparent---	Nov-Jul	Very long	1.0
5047:									
Aquents----------	---	Occasional	Long------	Feb-Nov	0.0-1.0	Apparent---	Nov-Jul	Very long	1.0
5051:									
Fluvaquents-----	D	None--------	---	---	0.0-1.0	Apparent---	Nov-Jul	Long------	1.0
5090:									
Aquents----------	---	Rare--------	---	---	0.0-2.0	Apparent---	Nov-Jul	Very long	0.5
Orthents.									

Table 25.--Soil Features

(See text for definitions of terms used in this table. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Map symbol and soil name	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
	In				
1C:					
Ida	>60	---	High	Low	Low.
1C3:					
Ida	>60	---	High	Low	Low.
1D:					
Ida	>60	---	High	Low	Low.
1D3:					
Ida	>60	---	High	Low	Low.
1E:					
Ida	>60	---	High	Low	Low.
1E3:					
Ida	>60	---	High	Low	Low.
1F:					
Ida	>60	---	High	Low	Low.
1F3:					
Ida	>60	---	High	Low	Low.
1G:					
Ida	>60	---	High	Low	Low.
2G:					
Hamburg	>60	---	High	Low	Low.
3D:					
Castana	>60	---	High	Low	Low.
3E:					
Castana	>60	---	High	Low	Low.
3F:					
Castana	>60	---	High	Low	Low.
10B:					
Monona	>60	---	High	Low	Low.
10C:					
Monona	>60	---	High	Low	Low.
10C2:					
Monona	>60	---	High	Low	Low.
10C3:					
Monona	>60	---	High	Low	Low.
10D:					
Monona	>60	---	High	Low	Low.
10D2:					
Monona	>60	---	High	Low	Low.

Table 25.--Soil Features--Continued

Map symbol and soil name	Bedrock Depth	Bedrock Hardness	Potential frost action	Risk of corrosion Uncoated steel	Risk of corrosion Concrete
	In				
10D3:					
Monona----------	>60	---	High--------	Low---------	Low.
10E:					
Monona----------	>60	---	High--------	Low---------	Low.
10E2:					
Monona----------	>60	---	High--------	Low---------	Low.
10E3:					
Monona----------	>60	---	High--------	Low---------	Low.
10F:					
Monona----------	>60	---	High--------	Low---------	Low.
10F2:					
Monona----------	>60	---	High--------	Low---------	Low.
10F3:					
Monona----------	>60	---	High--------	Low---------	Low.
10G:					
Monona----------	>60	---	High--------	Low---------	Low.
12B:					
Napier----------	>80	---	High--------	Low---------	Low.
12C:					
Napier----------	>80	---	High--------	Low---------	Low.
12D:					
Napier----------	>80	---	High--------	Low---------	Low.
17B:					
Napier----------	>80	---	High--------	Low---------	Low.
Kennebec--------	>72	---	High--------	Moderate----	Low.
Colo------------	>60	---	High--------	High--------	Moderate.
33D:					
Steinauer-------	>60	---	Moderate----	High--------	Low.
33E:					
Steinauer-------	>60	---	Moderate----	High--------	Low.
33F:					
Steinauer-------	>60	---	Moderate----	High--------	Low.
33G:					
Steinauer-------	>60	---	Moderate----	High--------	Low.
36:					
Salix-----------	>60	---	High--------	Moderate----	Low.
44:					
Blencoe---------	>60	---	High--------	High--------	Low.
46:					
Keg-------------	>60	---	High--------	Low---------	Low.

Table 25.--Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
54:					
Zook------------	>80	---	High---------	High---------	Moderate.
54+:					
Zook------------	>80	---	High---------	High---------	Moderate.
66:					
Luton-----------	>78	---	Moderate-----	High---------	Low.
66+:					
Luton-----------	>78	---	Moderate-----	High---------	Low.
67:					
Woodbury--------	>60	---	High---------	High---------	Low.
68:					
Napa------------	>60	---	Moderate-----	High---------	Moderate.
70:					
McPaul----------	>60	---	High---------	Low----------	Low.
123:					
Grantcenter-----	>80	---	High---------	Moderate-----	Low.
133:					
Colo------------	>60	---	High---------	High---------	Moderate.
133+:					
Colo------------	>60	---	High---------	High---------	Moderate.
137:					
Haynie----------	>60	---	High---------	Low----------	Low.
144:					
Blake-----------	>60	---	High---------	High---------	Low.
145:					
Onawa-----------	>60	---	High---------	High---------	Low.
146:					
Onawa-----------	>60	---	High---------	High---------	Low.
147:					
Modale----------	>60	---	High---------	High---------	Low.
149:					
Modale----------	>60	---	High---------	High---------	Low.
155:					
Albaton---------	>72	---	Moderate-----	High---------	Low.
156:					
Albaton---------	>72	---	Moderate-----	High---------	Low.
157:					
Albaton---------	>72	---	Moderate-----	High---------	Low.
212:					
Kennebec--------	>72	---	High---------	Moderate-----	Low.
212+:					
Kennebec--------	>72	---	High---------	Moderate-----	Low.

Table 25.--Soil Features--Continued

Map symbol and soil name	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
	In				
220: Nodaway	>60	---	High	Moderate	Low.
234: Nishna	>60	---	Moderate	High	Low.
237: Sarpy	>60	---	Low	Low	Low.
237B: Sarpy	>60	---	Low	Low	Low.
244: Blend	>60	---	High	High	Low.
255: Cooper	>60	---	High	High	Low.
257: Uturin	>60	---	Moderate	High	Low.
266: Smithland	>60	---	High	High	Moderate.
275: Moville	>72	---	High	High	Low.
366: Luton	>78	---	Moderate	High	Low.
430: Ackmore	>72	---	High	High	Low.
436: Lakeport	>60	---	High	High	Low.
446: Burcham	>60	---	High	High	Low.
465: Tieville	>60	---	Moderate	High	Low.
510: Monona	>60	---	High	Low	Low.
510B: Monona	>60	---	High	Low	Low.
510C: Monona	>60	---	High	Low	Low.
510C2: Monona	>60	---	High	Low	Low.
510C3: Monona	>60	---	High	Low	Low.
514: Grable	>60	---	Low	Low	Low.
515: Percival	>60	---	Moderate	High	Low.

Table 25.--Soil Features--Continued

Map symbol and soil name	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
	In				
516:					
Vore------------	>60	---	High--------	High--------	Low.
552:					
Owego-----------	>72	---	Moderate----	High--------	Low.
553:					
Forney----------	>60	---	Moderate----	High--------	Low.
670:					
Rawles----------	>72	---	High--------	Moderate----	Low.
717D:					
Napier----------	>80	---	High--------	Low---------	Low.
Gullied land.					
746:					
Lossing---------	>80	---	High--------	High--------	Low.
747:					
Rodney----------	>78	---	High--------	High--------	Low.
748:					
Hornick---------	>80	---	High--------	High--------	Low.
754:					
Larpenteur------	>60	---	High--------	High--------	Low.
945:					
Albaton---------	>72	---	High--------	High--------	Low.
946:					
Albaton---------	>72	---	High--------	High--------	Low.
1137:					
Haynie----------	>60	---	High--------	Low---------	Low.
1144:					
Blake-----------	>60	---	High--------	High--------	Low.
1145:					
Onawa-----------	>60	---	High--------	High--------	Low.
1146:					
Onawa-----------	>60	---	High--------	High--------	Low.
1147:					
Modale----------	>60	---	High--------	High--------	Low.
1150:					
Modale----------	>60	---	High--------	High--------	Low.
1155:					
Albaton---------	>72	---	Moderate----	High--------	Low.
1156:					
Albaton---------	>72	---	Moderate----	High--------	Low.
1157:					
Albaton---------	>72	---	Moderate----	High--------	Low.

Table 25.--Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
1220:					
Nodaway	>60	---	High	Moderate	Low.
1237:					
Sarpy	>60	---	Low	Low	Low.
1237B:					
Sarpy	>60	---	Low	Low	Low.
1514:					
Grable	>60	---	Low	Low	Low.
1515:					
Percival	>60	---	Moderate	High	Low.
1516:					
Vore	>60	---	High	High	Low.
1524:					
Morconick	>93	---	Low	Low	Low.
1525:					
Scroll	>60	---	Moderate	High	Low.
1526:					
Scroll	>60	---	Moderate	High	Low.
1552:					
Owego	>72	---	Moderate	High	Low.
1746:					
Lossing	>80	---	High	High	Low.
1747:					
Rodney	>78	---	High	High	Low.
1750:					
Ticonic	>80	---	Low	Low	Low.
1849:					
Kenmoor	>60	---	Moderate	High	Low.
5010:					
Pits.					
5040:					
Orthents.					
5044:					
Fluvaquents.					
5045, 5046, 5047:					
Aquents.					
5051:					
Fluvaquents	>60	---	Moderate	High	Low.

Table 25.--Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
5090:					
Aquents-Orthents.					

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Glossary

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Alpha,alpha-dipyridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redoximorphic feature.

Animal unit month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Backslope. The position that forms the steepest and generally linear, middle portion of a hillslope (fig. 17). In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope. A geomorphic component of hills (fig. 17) consisting of the concave to linear (perpendicular to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Beach deposits. Material, such as sand and gravel, that is generally laid down parallel to an active or relict shoreline of a post-glacial or glacial lake.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bench (structural). A platformlike, nearly level to gently inclined erosional surface developed in resistant strata in areas where valleys are cut in alternating strong and weak layers that are essentially horizontal.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A shallow depression from which all or most of the soil material has been removed by the wind.

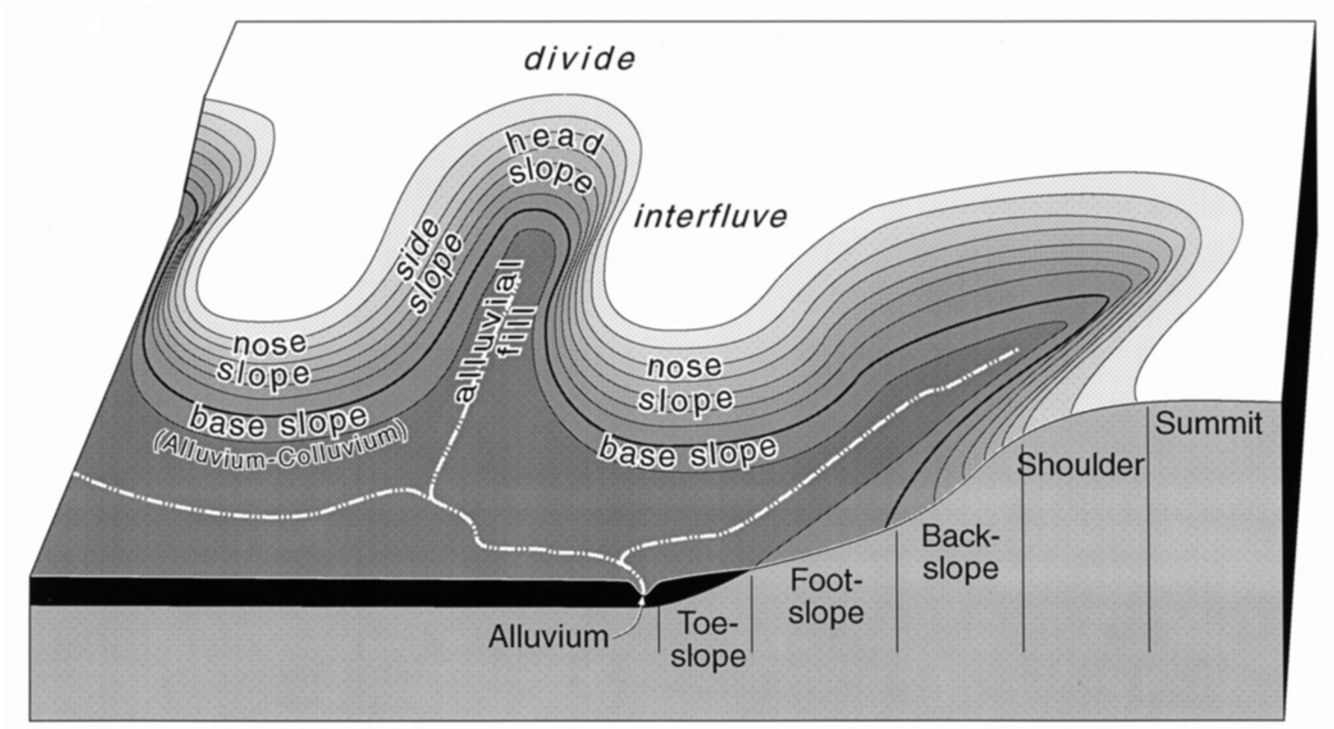


Figure 17.—Landscape relationship of geomorphic components and hillslope positions (modified after Ruhe and Walker, 1968).

A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or “chain,” of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

Channery soil material. Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the “Soil Survey Manual.”

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to

improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Delta. A body of alluvium having a surface that is nearly flat and fan shaped; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divide. (a) The line of separation, or (b) the summit area, or narrow tract of higher ground that constitutes the watershed boundary between two adjacent drainage basins (fig. 17); it divides the surface waters that flow naturally in one direction from those that flow in the opposite direction.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—***excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,*** and ***very poorly drained***. These classes are defined in the “Soil Survey Manual.”

Drainage, surface. Runoff, or surface flow of water, from an area.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic

processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.

Esker. A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fan terrace. A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called ***normal field capacity, normal moisture capacity,*** or ***capillary capacity***.

Fine textured soil. Sandy clay, silty clay, or clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flaggy soil material. Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Flood-plain splay. A fan-shaped deposit or other outspread deposit formed where an overloaded stream breaks through a levee (natural or artificial) and deposits its material (commonly coarse grained) on the flood plain.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Footslope. The position that forms the inner, gently inclined surface at the base of a hillslope (fig. 17). In profile, footslopes are commonly concave. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Geomorphology. The science that treats the general configuration of the earth's surface; specifically the study of the classification, description, nature, origin, and development of landforms and their relationships to underlying structures, and the history of geologic changes as recorded by these surface features. The term is especially applied to the genetic interpretation of landforms.

Glacial drift. Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits. Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head slope. A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway (fig. 17). The overland waterflow is converging.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-chroma zones. Zones having chroma of 3 or more. Typical color in areas of iron concentrations.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the “Soil Survey Manual.” The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material.

The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Ice-walled lake plain. A relict surface marking the floor of an extinct lake basin that was formed on solid ground and surrounded by stagnant ice in a stable or unstable superglacial environment on stagnation moraines. As the ice melted, the lake plain became perched above the adjacent landscape. The lake plain is well sorted, generally fine textured, stratified deposits.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Interfluve. An elevated area between two drainageways that sheds water to those drainageways (fig. 17).

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Iron concentrations. High-chroma zones having a high content of iron and manganese oxide because of chemical oxidation and accumulation, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic concentration.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or

into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame. An irregular, short ridge or hill of stratified glacial drift.

Kame moraine. An end moraine that contains numerous kames. A group of kames along the front of a stagnant glacier, commonly comprising the slumped remnants of a formerly continuous outwash plain built up over the foot of rapidly wasting or stagnant ice.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake bed. The bottom of a lake; a lake basin.

Lake plain. A nearly level surface marking the floor of an extinct lake filled by well sorted, generally fine textured, stratified deposits, commonly containing varves.

Lakeshore. A narrow strip of land in contact with or bordering a lake; especially the beach of a lake.

Lake terrace. A narrow shelf, partly cut and partly built, produced along a lakeshore in front of a scarp line of low cliffs and later exposed when the water level falls.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low-chroma zones. Zones having chroma of 2 or less. Typical color in areas of iron depletions.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Meander scroll. One of a series of long, parallel, close fitting, crescent-shaped ridges and troughs formed along the inner bank of a stream meander as the channel migrated laterally down-valley and toward the outer bank.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine. An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—***few, common,*** and ***many;*** size—***fine, medium,*** and ***coarse;*** and contrast—***faint, distinct,*** and ***prominent***. The size measurements are of the diameter along the greatest dimension. ***Fine*** indicates less than 5 millimeters (about 0.2 inch); ***medium,*** from 5 to 15 millimeters (about 0.2 to 0.6 inch); and ***coarse,*** more than 15 millimeters (about 0.6 inch).

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon. A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Nose slope. A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside (fig. 17). The overland waterflow is predominantly divergent.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Paleoterrace. An erosional remnant of a terrace that retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to, a present-day stream or drainage network.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, ***hardpan, fragipan, claypan, plowpan,*** and ***traffic pan***.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Parts per million (ppm). The concentration of a substance in the soil, such as phosphorus or potassium, in one million parts of air-dried soil on a weight per weight basis.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment. A thin layer of alluvial material that mantles an erosion surface and has been transported to its present position from higher lying areas of the erosion surface.

Pedon. The smallest volume that can be called “a soil.” A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as “saturated hydraulic conductivity,” which is defined in the

"Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

Impermeable	less than 0.0015 inch
Very slow	0.0015 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Phosphorus. The amount of phosphorus available to plants at a depth of 30 to 42 inches is expressed in parts per million and based on the weighted average of air-dried soil samples. Terms describing the amount of available phosphorus are:

Very low	less than 7.5 ppm
Low	7.5 to 13.0 ppm
Medium	13.0 to 22.5 ppm
High	more than 22.5 ppm

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitted outwash plain. An outwash plain marked by many irregular depressions, such as kettles, shallow pits, and potholes, which formed by melting of incorporated ice masses.

Pitting (in tables). Pits caused by melting around ice. They form on the soil after plant cover is removed.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plateau. An extensive upland mass with relatively flat summit area that is considerably elevated (more than 100 meters) above adjacent lowlands and separated from them on one or more sides by escarpments.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potassium. The amount of potassium available to plants at a depth of 12 to 24 inches is expressed in parts per million and based on the weighted average of air-dried soil samples. Terms describing the amount of available potassium are:

Very low	less than 50 ppm
Low	50 to 79 ppm
Medium	79 to 125 ppm
High	more than 125 ppm

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8

Moderately alkaline .... 7.9 to 8.4
Strongly alkaline .... 8.5 to 9.0
Very strongly alkaline .... 9.1 and higher

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saprolite. Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Second bottom. The first terrace above the normal flood plain (or first bottom) of a river.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shoulder. The position that forms the uppermost inclined surface near the top of a hillslope (fig. 17). It is a transition from backslope to summit. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Side slope. A geomorphic component of hills consisting of a laterally planar area of a hillside (fig. 17). The overland waterflow is predominantly parallel.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Sloughed till. Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodium adsorption ratio (SAR). A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief and by the passage of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stagnation moraine. A body of drift released by the melting of a glacier that ceased flowing. Commonly but not always occurs near ice margins; composed of till, ice-contact stratified drift, and small areas of glacial lake sediment. Typical landforms are knob-and-kettle topography, locally including ice-walled lake plains.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stream terrace. A platform or series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the

level of the stream, and representing the remnants of an abandoned flood plain, stream bed, or valley floor produced during a former stage of fluvial erosion or deposition.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—***platy*** (laminated), ***prismatic*** (vertical axis of aggregates longer than horizontal), ***columnar*** (prisms with rounded tops), ***blocky*** (angular or subangular), and ***granular***. ***Structureless*** soils are either ***single grained*** (each grain by itself, as in dune sand) or ***massive*** (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summit. The topographically highest position of a hillslope (fig. 17). It has a nearly level (planar or only slightly convex) surface.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the “plow layer,” or the “Ap horizon.”

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Swale. A slight depression in the midst of generally level land. A shallow depression in an undulating ground moraine caused by uneven glacial deposition.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geomorphology). A steplike surface, bordering a valley floor or shoreline, that represents the former position of a flood plain, lakeshore, or seashore. The term is usually applied to both the relatively flat summit surface (tread), cut or built by stream or wave action, and the steeper descending slope (scarp or riser), graded to a lower base level of erosion.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are ***sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,*** and ***clay***. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Till plain. An extensive area of nearly level to undulating soils underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The position that forms the gently inclined surface at the base of a hillslope (fig. 17). Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

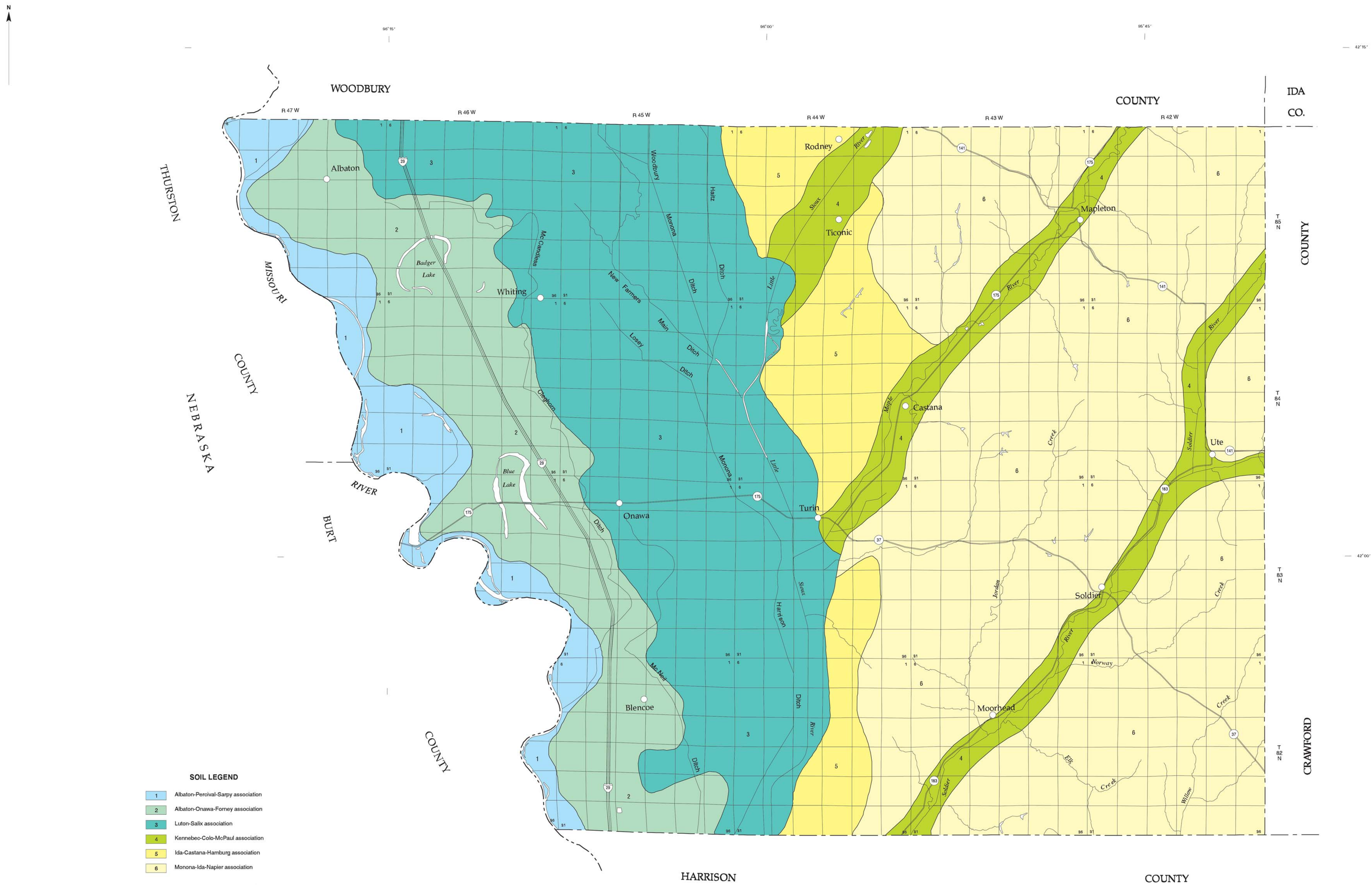
Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The uprooting and tipping over of trees by the wind.



SOIL LEGEND

1	Albaton-Percival-Sarpy association
2	Albaton-Onawa-Forney association
3	Luton-Salix association
4	Kennebec-Colo-McPaul association
5	Ida-Castana-Hamburg association
6	Monona-Ida-Napier association

Compiled 1995

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
IOWA AGRICULTURE AND HOME ECONOMICS EXPERIMENT STATION
COOPERATIVE EXTENSION SERVICE, IOWA STATE UNIVERSITY
DIVISION OF SOIL CONSERVATION, IOWA DEPARTMENT OF AGRICULTURE
AND LAND STEWARDSHIP

GENERAL SOIL MAP
MONONA COUNTY, IOWA

Scale 1:125000

4 0 4
MILES

8 0 8
KILOMETERS

SECTIONALIZED
TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Each area outlined on this map consists of more than one kind of soil. The map is meant for general planning rather than a basis for decisions on the use of specific tracts.

INDEX TO MAP SHEETS
MONONA COUNTY, IOWA

Scale 1:125000

MILES

KILOMETERS

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

SOIL LEGEND

Map symbols consist of numbers or a combination of numbers and a letter. The initial numbers represent the kind of soil. An uppercase letter following these numbers indicates the class of slope. Symbols without a slope letter are for nearly level soils or for miscellaneous areas. A final number of 2 following the slope letter indicates that the map unit is moderately eroded, and a final number of 3 indicates that the map unit is severely eroded. A plus sign in a map symbol indicates an overwash phase.

SYMBOL	NAME
1C	Ida silt loam, 5 to 9 percent slopes
1C3	Ida silt loam, 5 to 9 percent slopes, severely eroded
1D	Ida silt loam, 9 to 14 percent slopes
1D3	Ida silt loam, 9 to 14 percent slopes, severely eroded
1E	Ida silt loam, 14 to 20 percent slopes
1E3	Ida silt loam, 14 to 20 percent slopes, severely eroded
1F	Ida silt loam, 20 to 30 percent slopes
1F3	Ida silt loam, 20 to 30 percent slopes, severely eroded
1G	Ida silt loam, 30 to 40 percent slopes
2G	Hamburg silt loam, 40 to 75 percent slopes
3D	Castana silt loam, 9 to 14 percent slopes
3E	Castana silt loam, 14 to 20 percent slopes
3F	Castana silt loam, 20 to 30 percent slopes
10B	Monona silt loam, 2 to 5 percent slopes
10C	Monona silt loam, 5 to 9 percent slopes
10C2	Monona silt loam, 5 to 9 percent slopes, moderately eroded
10C3	Monona silt loam, 5 to 9 percent slopes, severely eroded
10D	Monona silt loam, 9 to 14 percent slopes
10D2	Monona silt loam, 9 to 14 percent slopes, moderately eroded
10D3	Monona silt loam, 9 to 14 percent slopes, severely eroded
10E	Monona silt loam, 14 to 20 percent slopes
10E2	Monona silt loam, 14 to 20 percent slopes, moderately eroded
10E3	Monona silt loam, 14 to 20 percent slopes, severely eroded
10F	Monona silt loam, 20 to 30 percent slopes
10F2	Monona silt loam, 20 to 30 percent slopes, moderately eroded
10F3	Monona silt loam, 20 to 30 percent slopes, severely eroded
10G	Monona silt loam, 30 to 40 percent slopes
12B	Napier silt loam, 2 to 5 percent slopes
12C	Napier silt loam, 5 to 9 percent slopes
12D	Napier silt loam, 9 to 14 percent slopes
17B	Napier-Kennebec-Colo complex, 0 to 5 percent slopes
33D	Steinauer clay loam, 9 to 14 percent slopes
33E	Steinauer clay loam, 14 to 18 percent slopes
33F	Steinauer clay loam, 18 to 25 percent slopes
33G	Steinauer clay loam, 25 to 40 percent slopes
36	Salix silty clay loam, 0 to 2 percent slopes, rarely flooded
44	Blencoe silty clay, 0 to 2 percent slopes, rarely flooded
46	Keg silt loam, 0 to 2 percent slopes, rarely flooded
54	Zook silty clay loam, 0 to 2 percent slopes, occasionally flooded
54+	Zook silt loam, 0 to 2 percent slopes, occasionally flooded, overwash
66	Luton silty clay, 0 to 1 percent slopes, rarely flooded
66+	Luton silt loam, 0 to 1 percent slopes, rarely flooded, overwash
67	Woodbury silty clay, 0 to 2 percent slopes, rarely flooded
68	Napa silty clay loam, 0 to 2 percent slopes, rarely flooded
70	McPaul silt loam, 0 to 2 percent slopes, rarely flooded
123	Grantcenter silty clay loam, 0 to 2 percent slopes, rarely flooded
133	Colo silty clay loam, 0 to 2 percent slopes, occasionally flooded
133+	Colo silt loam, 0 to 2 percent slopes, occasionally flooded, overwash
137	Haynie silt loam, 0 to 2 percent slopes, rarely flooded
144	Blake silty clay loam, 0 to 2 percent slopes, rarely flooded
145	Onawa silt loam, 0 to 2 percent slopes, rarely flooded
146	Onawa silty clay, 0 to 2 percent slopes, rarely flooded
147	Modale silty clay loam, 0 to 2 percent slopes, rarely flooded
149	Modale silt loam, 0 to 2 percent slopes, rarely flooded
155	Albaton silty clay loam, 0 to 2 percent slopes, rarely flooded
156	Albaton silty clay, 0 to 2 percent slopes, rarely flooded
157	Albaton silt loam, 0 to 2 percent slopes, rarely flooded
212	Kennebec silt loam, 0 to 2 percent slopes, occasionally flooded
212+	Kennebec silt loam, 0 to 2 percent slopes, occasionally flooded, overwash
220	Nodaway silt loam, 0 to 2 percent slopes, occasionally flooded
234	Nishna silty clay loam, 0 to 2 percent slopes, occasionally flooded
237	Sarpy loamy fine sand, 0 to 2 percent slopes, rarely flooded
237B	Sarpy loamy fine sand, 2 to 5 percent slopes, rarely flooded

SYMBOL	NAME
244	Blend silty clay, 0 to 2 percent slopes, rarely flooded
255	Cooper silty clay loam, 0 to 2 percent slopes, rarely flooded
257	Uturin silt loam, 0 to 2 percent slopes, occasionally flooded
266	Smithland silty clay loam, 0 to 2 percent slopes, occasionally flooded
275	Moville silt loam, 0 to 2 percent slopes, rarely flooded
366	Luton silty clay loam, 0 to 1 percent slopes, rarely flooded
430	Ackmore silt loam, 0 to 2 percent slopes, occasionally flooded
436	Lakeport silty clay loam, 0 to 2 percent slopes, rarely flooded
446	Burcham silt loam, 0 to 2 percent slopes, rarely flooded
465	Tieville silty clay, 0 to 2 percent slopes, rarely flooded
510	Monona silt loam, bench, 0 to 2 percent slopes
510B	Monona silt loam, bench, 2 to 5 percent slopes
510C	Monona silt loam, bench, 5 to 9 percent slopes
510C2	Monona silt loam, bench, 5 to 9 percent slopes, moderately eroded
510C3	Monona silt loam, bench, 5 to 9 percent slopes, severely eroded
514	Grable silt loam, 0 to 2 percent slopes, rarely flooded
515	Percival silty clay, 0 to 2 percent slopes, rarely flooded
516	Vore silty clay loam, 0 to 2 percent slopes, rarely flooded
552	Owego silty clay, 0 to 2 percent slopes, rarely flooded
553	Forney silty clay, 0 to 2 percent slopes, rarely flooded
670	Rawles silt loam, 0 to 2 percent slopes, occasionally flooded
717D	Napier-Gullied land complex, 5 to 14 percent slopes
746	Lossing silty clay, 0 to 2 percent slopes, rarely flooded
747	Rodney silty clay, 0 to 2 percent slopes, rarely flooded
748	Hornick silty clay, 0 to 2 percent slopes, rarely flooded
754	Larpenteur silt loam, 0 to 2 percent slopes, rarely flooded
945	Albaton silty clay, depressional, drained, 0 to 1 percent slopes, frequently flooded
946	Albaton silty clay, depressional, undrained, 0 to 1 percent slopes, frequently flooded
1137	Haynie silt loam, 0 to 2 percent slopes, occasionally flooded
1144	Blake silty clay loam, 0 to 2 percent slopes, occasionally flooded
1145	Onawa silt loam, 0 to 2 percent slopes, occasionally flooded
1146	Onawa silty clay, 0 to 2 percent slopes, occasionally flooded
1147	Modale silty clay loam, 0 to 2 percent slopes, occasionally flooded
1150	Modale silt loam, 0 to 2 percent slopes, occasionally flooded
1155	Albaton silty clay loam, 0 to 2 percent slopes, occasionally flooded
1156	Albaton silty clay, 0 to 2 percent slopes, occasionally flooded
1157	Albaton silt loam, 0 to 2 percent slopes, occasionally flooded
1220	Nodaway silt loam, channeled, 0 to 2 percent slopes
1237	Sarpy loamy fine sand, 0 to 2 percent slopes, occasionally flooded
1237B	Sarpy loamy fine sand, 2 to 5 percent slopes, occasionally flooded
1514	Grable silt loam, 0 to 2 percent slopes, occasionally flooded
1515	Percival silty clay, 0 to 2 percent slopes, occasionally flooded
1516	Vore silty clay loam, 0 to 2 percent slopes, occasionally flooded
1524	Morconick very fine sandy loam, 0 to 2 percent slopes, occasionally flooded
1525	Scroll silty clay, 0 to 2 percent slopes, occasionally flooded
1526	Scroll silty clay loam, 0 to 2 percent slopes, occasionally flooded
1552	Owego silty clay, 0 to 2 percent slopes, occasionally flooded
1746	Lossing silty clay, 0 to 2 percent slopes, occasionally flooded
1747	Rodney silty clay, 0 to 2 percent slopes, occasionally flooded
1750	Ticonic fine sand, 0 to 2 percent slopes, occasionally flooded
1849	Kenmoor fine sandy loam, 0 to 2 percent slopes, occasionally flooded
5010	Pits, sand and gravel
5040	Orthents, loamy
5044	Fluvaquents, frequently flooded
5045	Aquents, loamy, rarely flooded
5046	Aquents, ponded, rarely flooded
5047	Aquents, ponded, occasionally flooded
5051	Fluvaquents, ponded
5090	Aquents-Orthents complex
AW	Animal waste
SL	Sewage lagoon
W	Water

Descriptions of Special Features

Name	Description
Blowout	A small saucer, cup, or trough-shaped hollow or depression formed by wind erosion, on a preexisting sand deposit. Typically 0.25 to 1.0 acre.
Borrow pit	An open excavation from which soil and underlying material have been removed, usually for construction purposes. Typically 0.5 to 1.0 acre.
Calcareous spot	An area of soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce strongly when treated with cold, dilute hydrochloric acid. Typically 0.25 to 0.5 acre.
Clay spot	An area in which clayey textures (including silty clay and clay) are within a depth of 24 inches. Typically 0.5 to 1.0 acre.
Escarpment, non-bedrock	A relatively continuous and steep slope or cliff, generally produced by erosion but in some places produced by faulting, that breaks the continuity of more gently sloping land surfaces. Exposed earthy material is nonsoil or very shallow soil.
Glacial till spot	An area of unsorted, nonstratified glacial drift consisting of clay, silt, sand, cobbles, stones, and boulders transported and deposited by glacial ice. Such areas are typically lower in fertility than the surrounding soils. They may or may not be calcareous. Typically 0.25 to 1.0 acre.
Gravelly spot	A spot where the surface layer has 15 to 50 percent, by volume, rock fragments that are mostly less than 3 inches in diameter. These spots are typically droughty. Typically 0.25 to 1.0 acre.
Gully	A small channel with steep sides cut by running water through which water ordinarily runs only after a rain or after melting of ice and snow. It generally is an obstacle to wheeled vehicles and is too deep to be obliterated by ordinary tillage.
Gypsum spot	An area of soil containing calcium sulfate. Typically 0.25 to 0.5 acre.
Marsh or swamp	A water-satured, poorly drained or very poorly drained area, intermittently or permanently ponded by water. Sedges, cattails, and rushes are the dominant vegetation in marsh areas, and trees or shrubs are the dominant vegetation in swamps. Typically 1 to 2 acres.
Sandy spot	A spot where the surface layer is 85 percent or more sand and less than 10 percent clay. These areas do not contain rock fragments. They are droughty and are surrounded by soils that are not sandy. Typically 0.25 to 1.0 acre.

Sandy substratum at a depth of 15-30 inches	Small areas that have loamy fine sand or sandy loam at a depth of 15 to 30 inches. Typically 0.5 to 1.0 acre.
Severely eroded spot	An area of severely eroded soil surrounded by soils that are only slightly or moderately eroded. Such areas typically have a lower content of organic matter, a thinner surface layer, and a higher content of clay than the less eroded surrounding soils. Typically 0.25 to 0.5 acre.
Short steep slope	A narrow area of soil having slopes that are at least two slope classes steeper than the slope class of the surrounding map unit. Typically less than 1 acre.
Wet depression silt loam surface	A shallow, concave area in which water is ponded for intermittent periods. The soils in these areas are typically not shallow to bedrock and have a gray subsurface layer. They are somewhat poorly drained or poorly drained. Typically 0.5 acre to 2.0 acres.
Wet spot	An area of soil that is at least one drainage class wetter than the surrounding soils. Typically 0.5 acre to 2.0 acres.

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MONONA COUNTY, IOWA
ALBATON_NW QUADRANGLE
SHEET NUMBER 1 OF 74

96° 22′30″ 42°15′00″ R. 47 W. 96°18′45″ 42°15′00″

(Joins sheet 2, Albaton_NE)

42°11′15″ 96° 22′30″ R. 47 W. 42°11′15″ 96°18′45″

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH

QUARTER QUADRANGLE LOCATION

(Joins sheet 13, Albaton_SW)

SCALE 1:12000

MILES: 0.5 0 0.5

FEET: 500 0 500 1000 1500 2000 2500 3000 3500

KILOMETERS: 0.5 0 0.5

1	2	3
4		5
6	7	8

1 HOMER_SE
2 SALIX_SW
3 SALIX_SE
4 WALTHILL_NE
5 ALBATON_NE
6 WALTHILL_SE
7 ALBATON_SW
8 ALBATON_SE

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3.75 MINUTE SERIES
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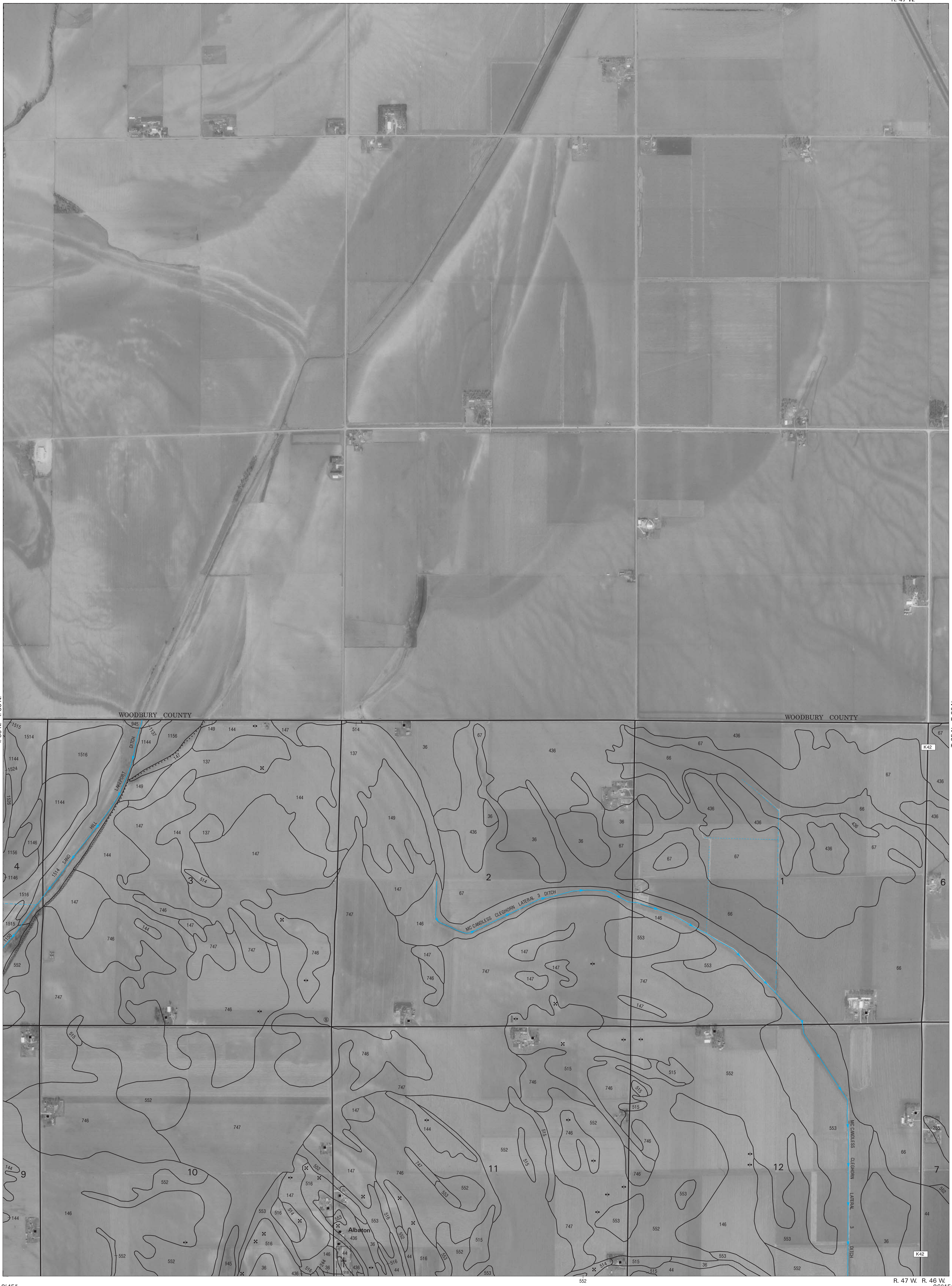
UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MONONA COUNTY, IOWA
ALBATON_NE QUADRANGLE
SHEET NUMBER 2 OF 74

96°18′45″ 42°15′00″ R. 47 W. 96°15′00″ 42°15′00″

(Joins sheet 1, Albaton_NW)



(Joins sheet 3, Sloan_NW)

42°11′15″ 96°18′45″ R. 47 W. R. 46 W. 42°11′15″ 96°15′00″

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North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH

QUARTER QUADRANGLE LOCATION

(Joins sheet 14, Albaton_SE)

SCALE 1:12000

0.5 0 0.5 MILES

500 0 500 1000 1500 2000 2500 3000 3500 FEET

0.5 0 0.5 KILOMETERS

1	2	3
4		5
6	7	8

1 SALIX_SW
2 SALIX_SE
3 LUTON_SW
4 ALBATON_NW
5 SLOAN_NW
6 ALBATON_SW
7 ALBATON_SE
8 SLOAN_SW

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ALBATON_NE, IOWA
3.75 MINUTE SERIES
SHEET NUMBER 2 OF 74

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MONONA COUNTY, IOWA
SLOAN_NW QUADRANGLE
SHEET NUMBER 3 OF 74

96°15′00″ 42°15′00″ R. 46 W. 96°11′15″ 42°15′00″

(Joins sheet 2, Albaton_NE)

(Joins sheet 4, Sloan_NE)

42°11′15″ 96°15′00″ R. 46 W. 42°11′15″ 96°11′15″

(Joins sheet 15, Sloan_SW)

SCALE 1:12000

MILES 0.5 0 0.5

FEET 500 0 500 1000 1500 2000 2500 3000 3500

KILOMETERS 0.5 0 0.5

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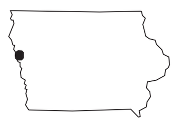
North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH



QUARTER QUADRANGLE LOCATION

1	2	3	1 SALIX_SE 2 LUTON_SW 3 LUTON_SE
4		5	4 ALBATON_NE 5 SLOAN_NE 6 ALBATON_SE
6	7	8	7 SLOAN_SW 8 SLOAN_SE

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SLOAN_NW, IOWA
3.75 MINUTE SERIES
SHEET NUMBER 3 OF 74

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MONONA COUNTY, IOWA
SLOAN_NE QUADRANGLE
SHEET NUMBER 4 OF 74

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH

QUARTER QUADRANGLE LOCATION

(Joins sheet 16, Sloan_SE)

SCALE 1:12000

MILES

FEET

KILOMETERS

1	2	3
4		5
6	7	8

1 LUTON_SW
2 LUTON_SE
3 CLIMBING_HILL_SW
4 SLOAN_NW
5 HORNICK_NW
6 SLOAN_SW
7 SLOAN_SE
8 HORNICK_SW

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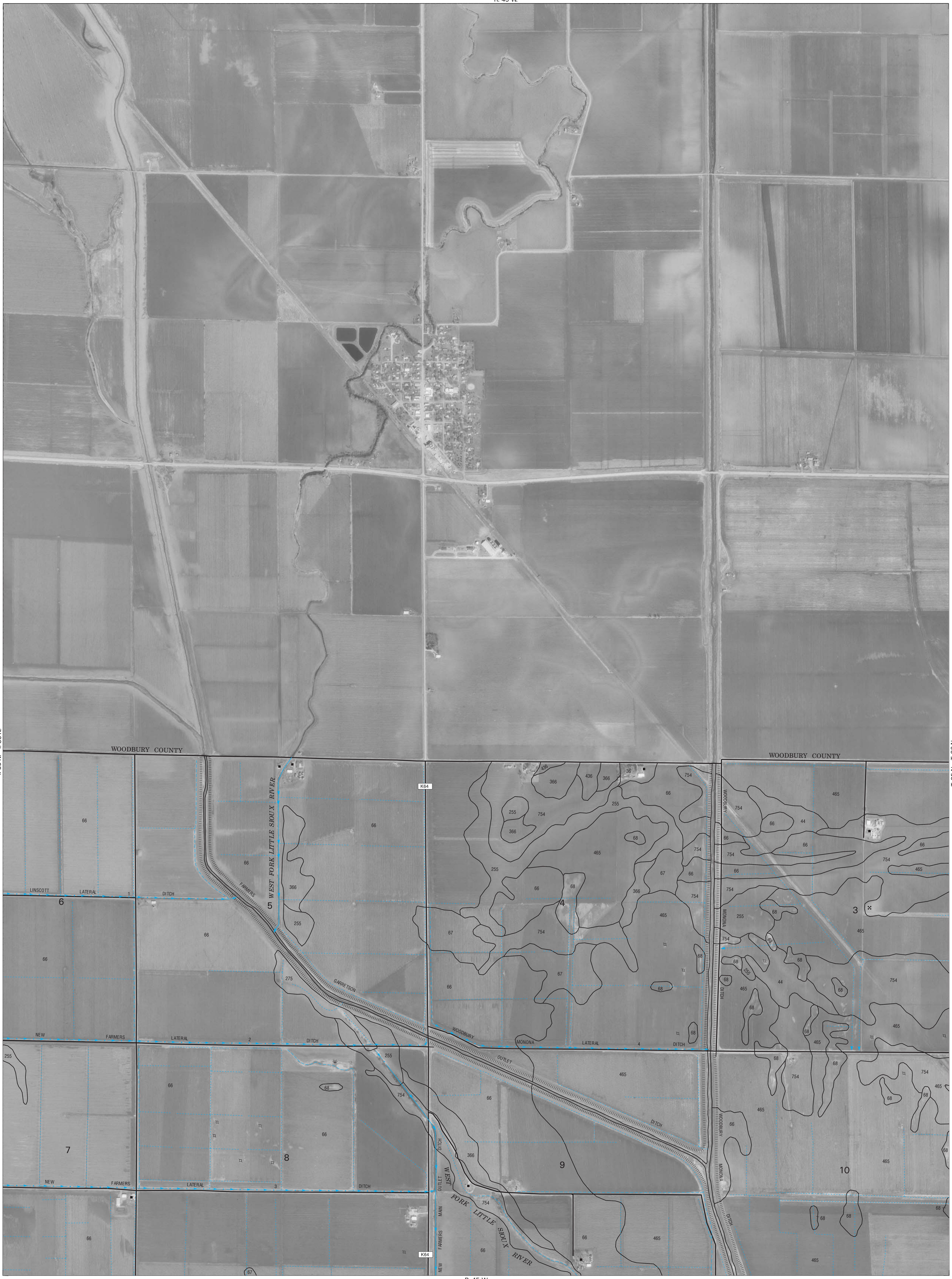
UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MONONA COUNTY, IOWA
HORNICK_NW QUADRANGLE
SHEET NUMBER 5 OF 74



(Joins sheet 17, Hornick_SW)

SCALE 1:12000

MILES

FEET

KILOMETERS

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH

QUARTER QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

1 LUTON_SE
2 CLIMBING_HILL_SW
3 CLIMBING_HILL_SE
4 SLOAN_NE
5 HORNICK_NE
6 SLOAN_SE
7 HORNICK_SW
8 HORNICK_SE

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UNITED STATES
DEPARTMENT OF AGRICULTURE
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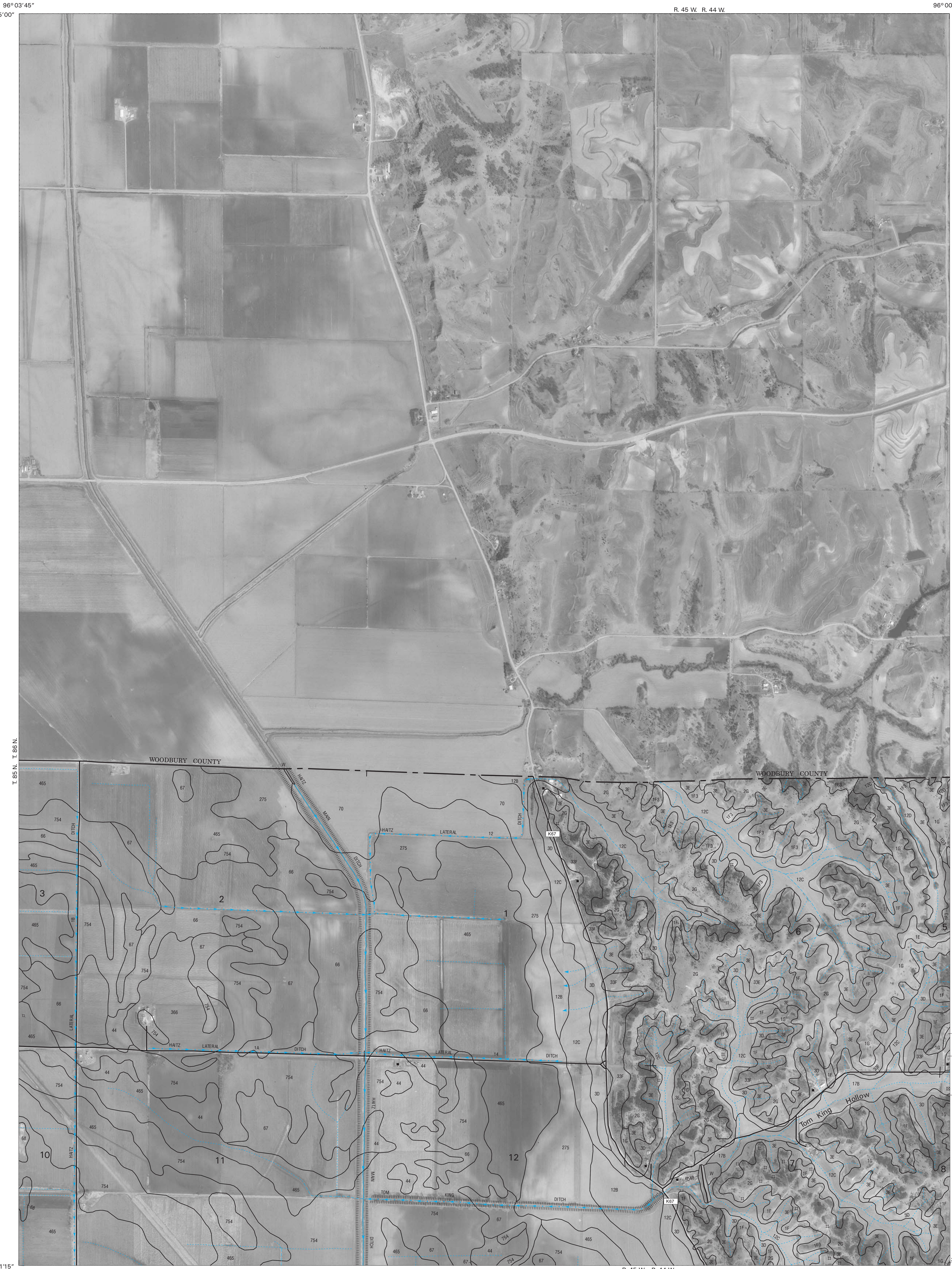
MONONA COUNTY, IOWA
HORNICK_NE QUADRANGLE
SHEET NUMBER 6 OF 74



This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

QUARTER QUADRANGLE LOCATION

(Joins sheet 18, Hornick_SE)

SCALE 1:12000

0.5 0 0.5
MILES
500 0 500 1000 1500 2000 2500 3000 3500
FEET
0.5 0 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 CLIMBING_HILL_SW
2 CLIMBING_HILL_SE
3 OTO_SW
4 HORNICK_NW
5 SMITHLAND_NW
6 HORNICK_SW
7 HORNICK_SE
8 SMITHLAND_SW

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UNITED STATES
DEPARTMENT OF AGRICULTURE
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MONONA COUNTY, IOWA
SMITHLAND_NW QUADRANGLE
SHEET NUMBER 7 OF 74

(Joins sheet 19, Smithland_SW)

SCALE 1:12000

MILES

FEET

KILOMETERS

NORTH

QUARTER QUADRANGLE LOCATION

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

1 CLIMBING_HILL_SE
2 OTO_SW
3 OTO_SE
4 HORNICK_NE
5 SMITHLAND_NE
6 HORNICK_SE
7 SMITHLAND_SW
8 SMITHLAND_SE

INDEX TO ADJOINING 3.75 MAPS

SMITHLAND_NW, IOWA
3.75 MINUTE SERIES
SHEET NUMBER 7 OF 74

95° 56′15″ 42°15′00″ R. 44 W. R. 43 W. 95° 52′30″ 42°15′00″

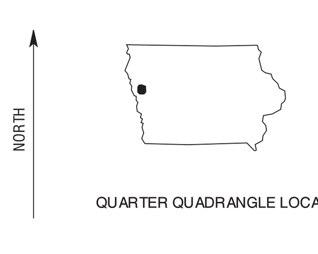
(Joins sheet 7, Smithland_NW)

(Joins sheet 9, Mapleton_NW)

42°11′15″ 95° 56′15″ R. 44 W. R. 43 W. 42°11′15″ 95° 52′30″

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

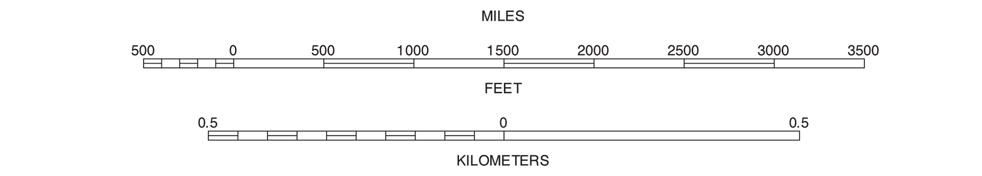
North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.



QUARTER QUADRANGLE LOCATION

(Joins sheet 20, Smithland_SE)

SCALE 1:12000



1	2	3
4		5
6	7	8

1 OTO_SW
2 OTO_SE
3 CORRECTIONVILLE_SE_SW
4 SMITHLAND_NW
5 MAPLETON_NW
6 SMITHLAND_SW
7 SMITHLAND_SE
8 MAPLETON_SW

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UNITED STATES
DEPARTMENT OF AGRICULTURE
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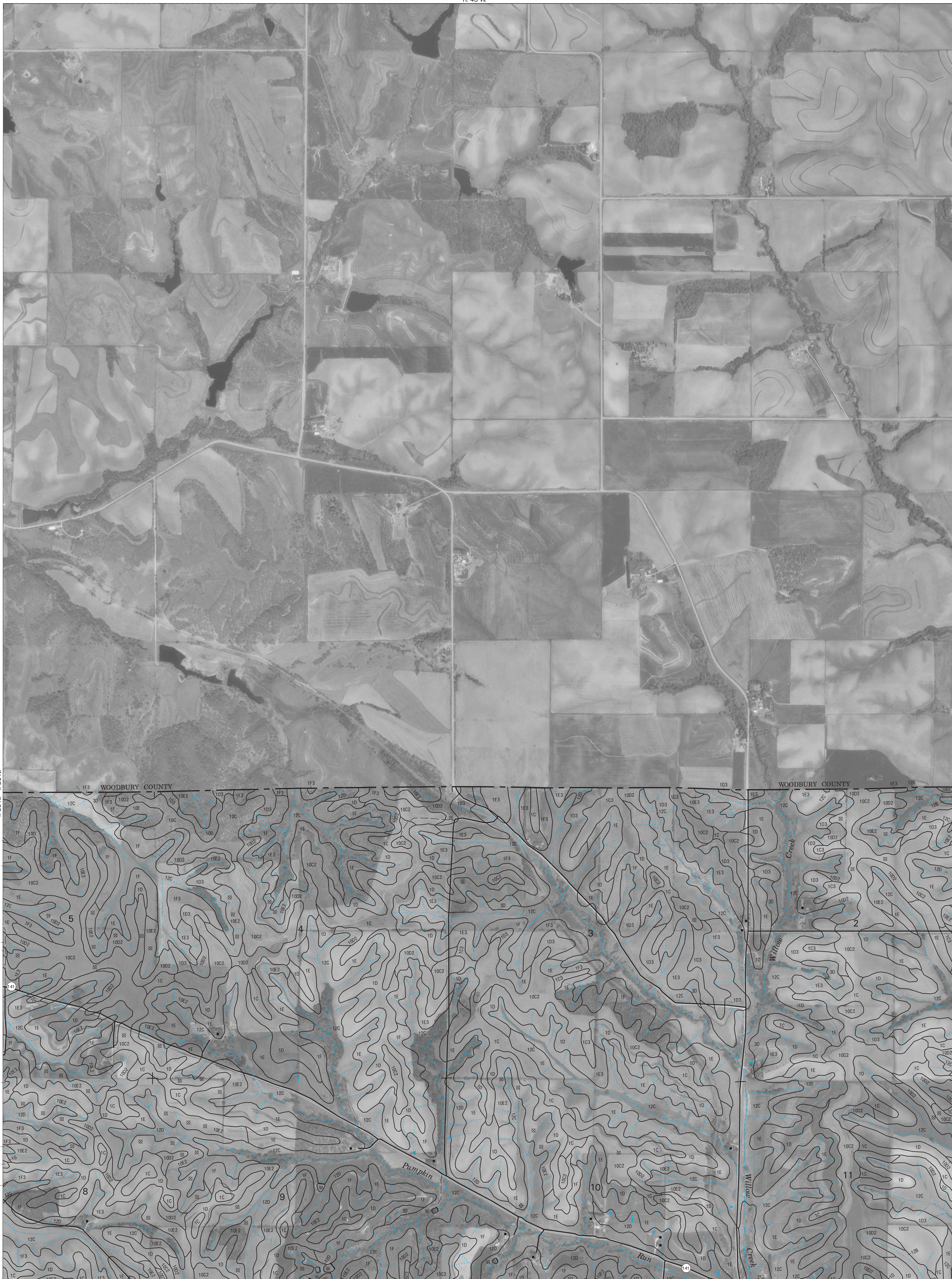
MONONA COUNTY, IOWA
MAPLETON_NW QUADRANGLE
SHEET NUMBER 9 OF 74

95° 52′30″ 42°15′00″ R. 43 W. 95° 48′45″ 42°15′00″

(Joins sheet 8, Smithland_NE)



(Joins sheet 10, Mapleton_NE)

42°11′15″ 95° 52′30″ R. 43 W. 42°11′15″ 95° 48′45″

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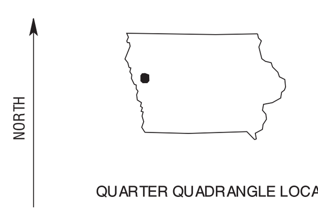
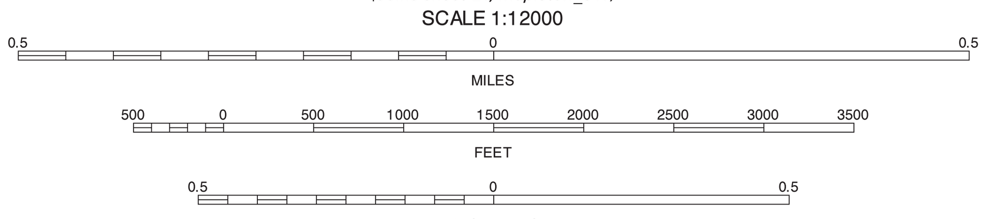


QUARTER QUADRANGLE LOCATION

(Joins sheet 21, Mapleton_SW)

SCALE 1:12000



1	2	3
4		5
6	7	8

1 OTO_SE
2 CORRECTIONVILLE_SE_SW
3 CORRECTIONVILLE_SE_SE
4 SMITHLAND_NE
5 MAPLETON_NE
6 SMITHLAND_SE
7 MAPLETON_SW
8 MAPLETON_SE

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SHEET NUMBER 9 OF 74

UNITED STATES
DEPARTMENT OF AGRICULTURE
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MONONA COUNTY, IOWA
MAPLETON_NE QUADRANGLE
SHEET NUMBER 10 OF 74

(Joins sheet 22, Mapleton_SE)

SCALE 1:12000

MILES

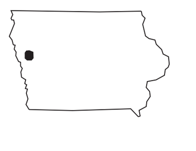
FEET

KILOMETERS

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH



QUARTER QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

1 CORRECTIONVILLE_SE_SW
2 CORRECTIONVILLE_SE_SE
3 HOLSTEIN_SW_SW
4 MAPLETON_NW
5 DANBURY_NW
6 MAPLETON_SW
7 MAPLETON_SE
8 DANBURY_SW

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UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

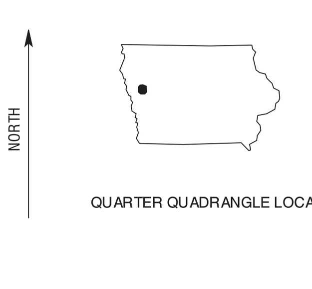
MONONA COUNTY, IOWA
DANBURY_NW QUADRANGLE
SHEET NUMBER 11 OF 74

(Joins sheet 23, Danbury_SW)

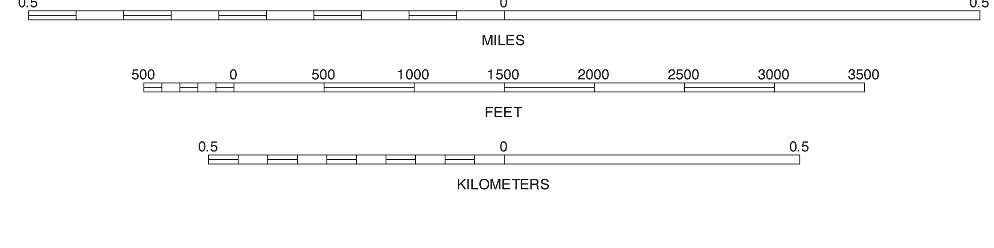
SCALE 1:12000

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid
1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.



QUARTER QUADRANGLE LOCATION



1	2	3
4		5
6	7	8

1 CORRECTIONVILLE_SE_SE
2 HOLSTEIN_SW_SW
3 HOLSTEIN_SW_SE
4 MAPLETON_NE
5 DANBURY_NE
6 MAPLETON_SE
7 DANBURY_SW
8 DANBURY_SE

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UNITED STATES
DEPARTMENT OF AGRICULTURE
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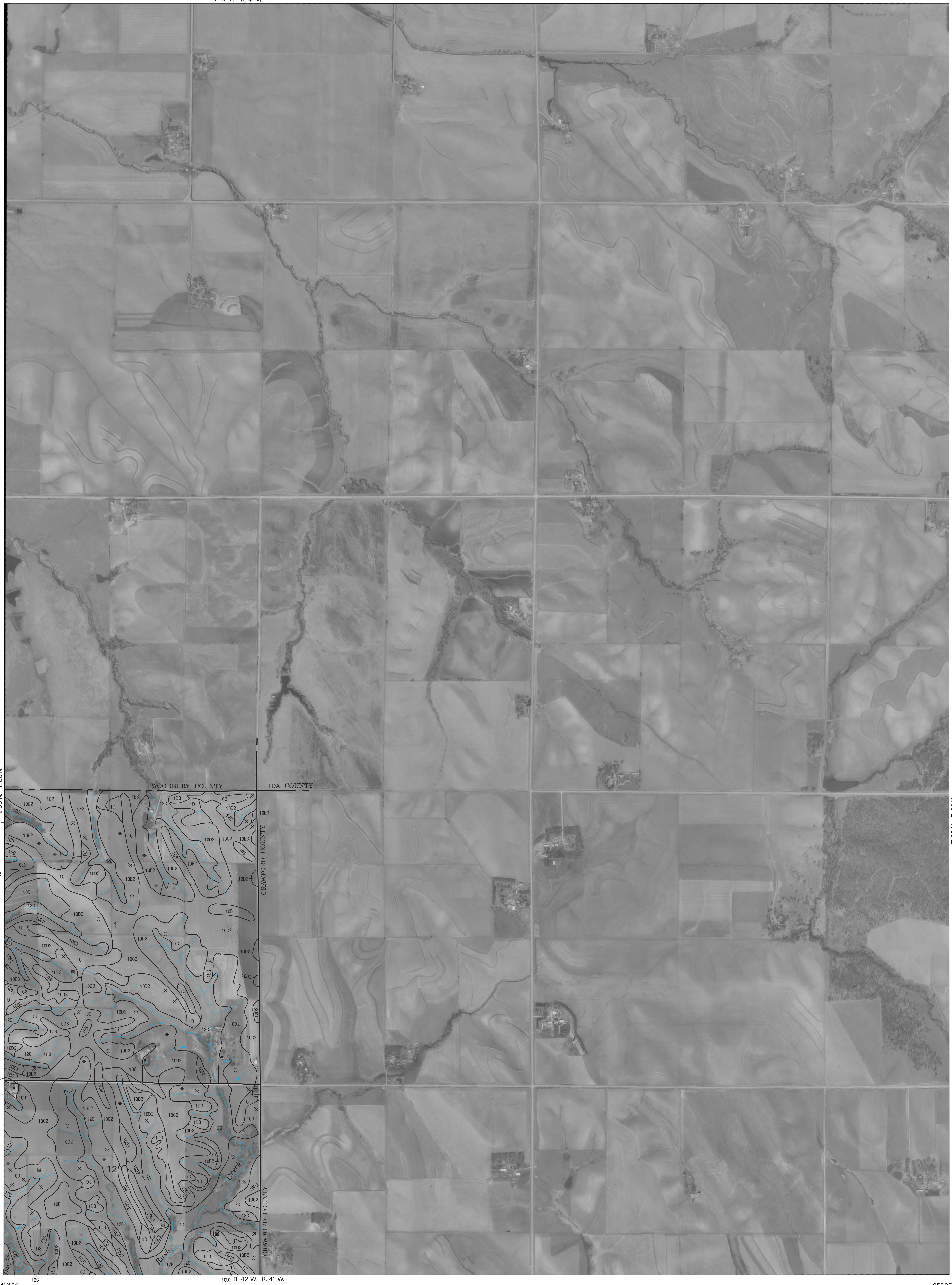
MONONA COUNTY, IOWA
DANBURY_NE QUADRANGLE
SHEET NUMBER 12 OF 74



This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

QUARTER QUADRANGLE LOCATION

(Joins sheet 24, Danbury_SE)

SCALE 1:12000

0.5 0 0.5
MILES

500 0 500 1000 1500 2000 2500 3000 3500
FEET

0.5 0 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 HOLSTEIN_SW_SW
2 HOLSTEIN_SW_SE
3 BATTLE_CREEK_SW
4 DANBURY_NW
5 RICKETTS_NW
6 DANBURY_SW
7 DANBURY_SE
8 RICKETTS_SW

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3.75 MINUTE SERIES
SHEET NUMBER 12 OF 74

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MONONA COUNTY, IOWA
ALBATON_SW QUADRANGLE
SHEET NUMBER 13 OF 74

(Joins sheet 1, Albaton_NW)

96° 22′30″ 42°11′15″ R. 47 W. 96°18′45″ 42°11′15″

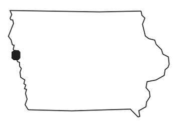
(Joins sheet 14, Albaton_SE)

42° 07′30″ 96° 22′30″ R. 47 W. 42° 07′30″ 96°18′45″

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH



QUARTER QUADRANGLE LOCATION

SCALE 1:12000

0.5 0 0.5
MILES

500 0 500 1000 1500 2000 2500 3000 3500
FEET

0.5 0 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 WALTHILL_NE
2 ALBATON_NW
3 ALBATON_NE
4 WALTHILL_SE
5 ALBATON_SE
6 WALTHILL_SW_NE
7 MACY_NW
8 MACY_NE

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ALBATON_SW, IOWA
3.75 MINUTE SERIES
SHEET NUMBER 13 OF 74

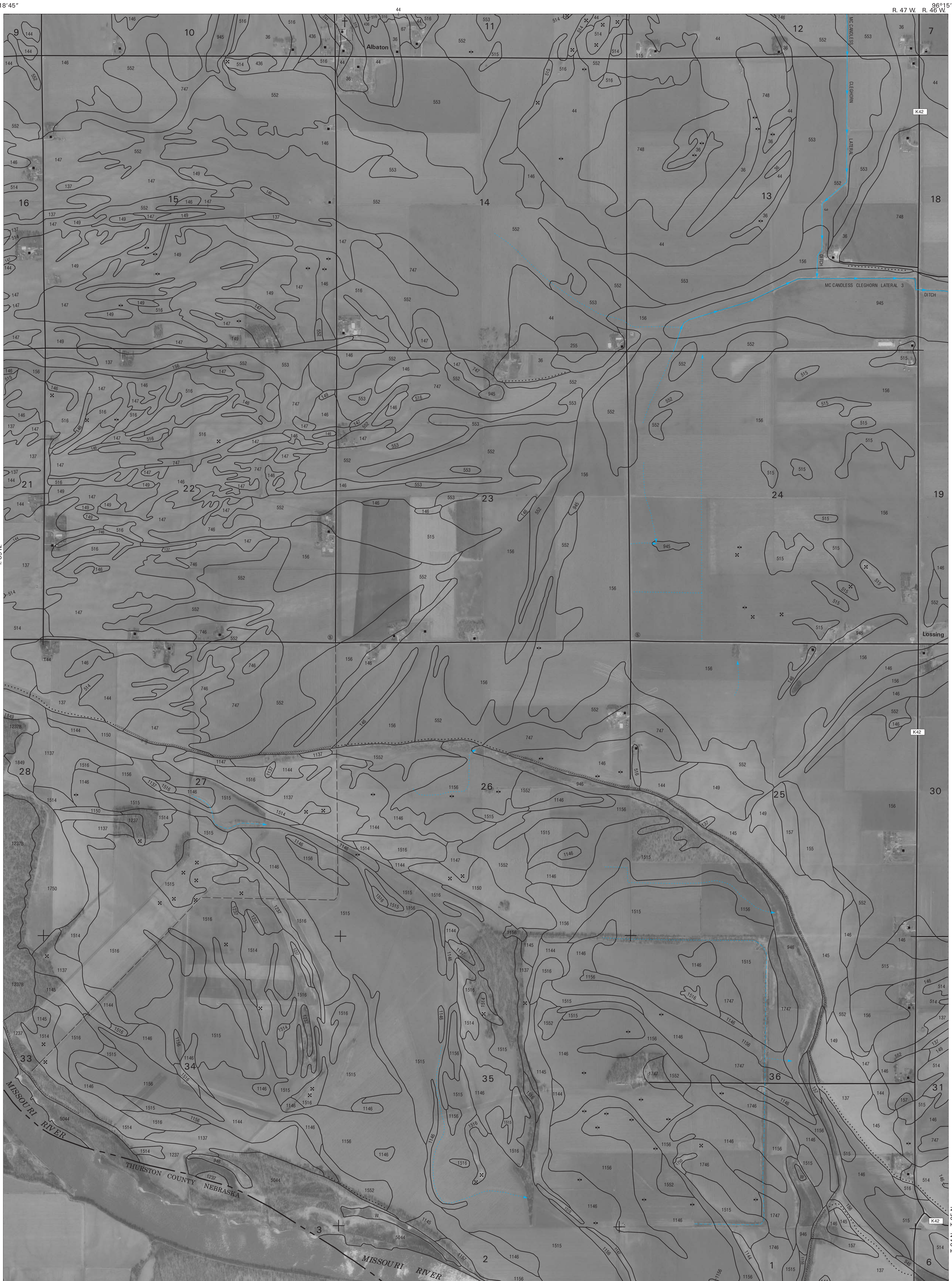
UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MONONA COUNTY, IOWA
ALBATON_SE QUADRANGLE
SHEET NUMBER 14 OF 74

(Joins sheet 2, Albaton_NE)

96°18'45" 42°11'15" — 96°15'00" 42°11'15"

R. 47 W. R. 46 W.



T. 85 N.

T. 84 N. T. 85 N.

(Joins sheet 13, Albaton_SW)

(Joins sheet 15, Sloan_SW)

42°07'30" 96°18'45" — R. 47 W. R. 46 W. 42°07'30" 96°15'00"

5044

(Joins sheet 25, Macy_NE)

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH

QUARTER QUADRANGLE LOCATION

SCALE 1:12000

MILES: 0.5 0 0.5

FEET: 500 0 500 1000 1500 2000 2500 3000 3500

KILOMETERS: 0.5 0 0.5

1	2	3
4		5
6	7	8

1 ALBATON_NW
2 ALBATON_NE
3 SLOAN_NW
4 ALBATON_SW
5 SLOAN_SW
6 MACY_NW
7 MACY_NE
8 ONAWA_SW_NW

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ALBATON_SE, IOWA
3.75 MINUTE SERIES
SHEET NUMBER 14 OF 74

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MONONA COUNTY, IOWA
SLOAN_SW QUADRANGLE
SHEET NUMBER 15 OF 74

(Joins sheet 3, Sloan_NW)

96°15′00″ 42°11′15″ — R. 46 W. — 96°11′15″ 42°11′15″

(Joins sheet 14, Albaton_SE)

(Joins sheet 16, Sloan_SE)

42°07′30″ 96°15′00″ — R. 46 W. — 42°07′30″ 96°11′15″

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid
1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

QUARTER QUADRANGLE LOCATION

(Joins sheet 26, Onawa_SW_NW)

SCALE 1:12000

0.5 — 0 — 0.5
MILES

500 — 0 — 500 — 1000 — 1500 — 2000 — 2500 — 3000 — 3500
FEET

0.5 — 0 — 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 ALBATON_NE
2 SLOAN_NW
3 SLOAN_NE
4 ALBATON_SE
5 SLOAN_SE
6 MACY_NE
7 ONAWA_SW_NW
8 ONAWA_SW_NE

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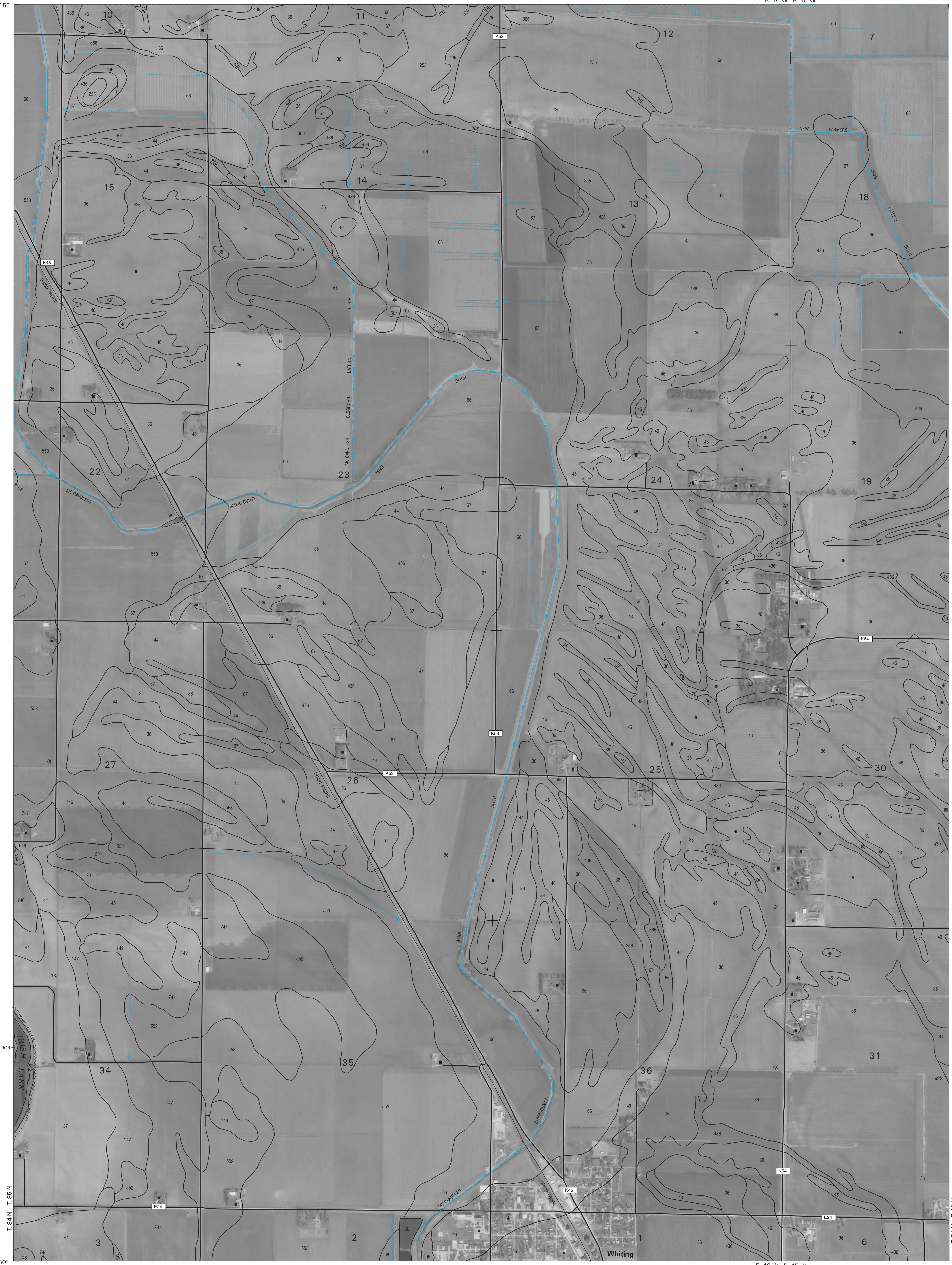
3.75 MINUTE SERIES
SHEET NUMBER 15 OF 74

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MONONA COUNTY, IOWA
SLOAN_SE QUADRANGLE
SHEET NUMBER 16 OF 74

(Joins sheet 4, Sloan_NE)



(Joins sheet 27, Onawa_SW_NE)

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH

QUARTER QUADRANGLE LOCATION

SCALE 1:12000

0.5 0 0.5
MILES

500 0 500 1000 1500 2000 2500 3000 3500
FEET

0.5 0 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 SLOAN_NW
2 SLOAN_NE
3 HORNICK_NW
4 SLOAN_SW
5 HORNICK_SW
6 ONAWA_SW_NW
7 ONAWA_SW_NE
8 ONAWA_NW

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3.75 MINUTE SERIES
SHEET NUMBER 16 OF 74

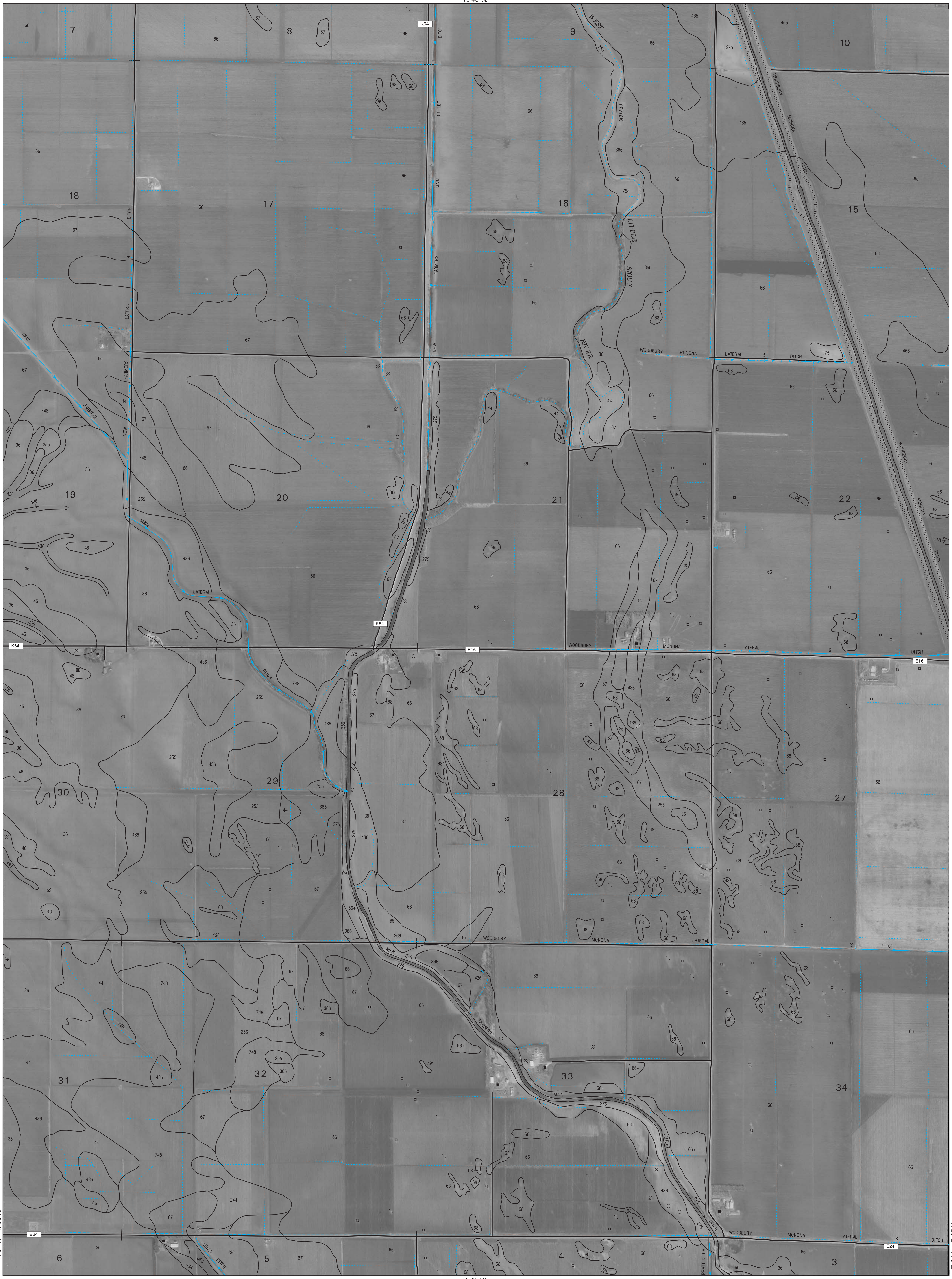
UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MONONA COUNTY, IOWA
HORNICK_SW QUADRANGLE
SHEET NUMBER 17 OF 74

(Joins sheet 5, Hornick_NW)

96° 07′30″ 42°11′15″ R. 45 W. 96° 03′45″ 42°11′15″

(Joins sheet 16, Sloan_SE) (Joins sheet 18, Hornick_SE)



T. 85 N. T. 84 N.

42° 07′30″ R. 45 W. 42° 07′30″
96° 07′30″ 96° 03′45″

(Joins sheet 28, Onawa_NW)

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

QUARTER QUADRANGLE LOCATION

SCALE 1:12000

0.5 0 0.5
MILES

500 0 500 1000 1500 2000 2500 3000 3500
FEET

0.5 0 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 SLOAN_NE
2 HORNICK_NW
3 HORNICK_NE
4 SLOAN_SE
5 HORNICK_SE
6 ONAWA_SW_NE
7 ONAWA_NW
8 ONAWA_NE

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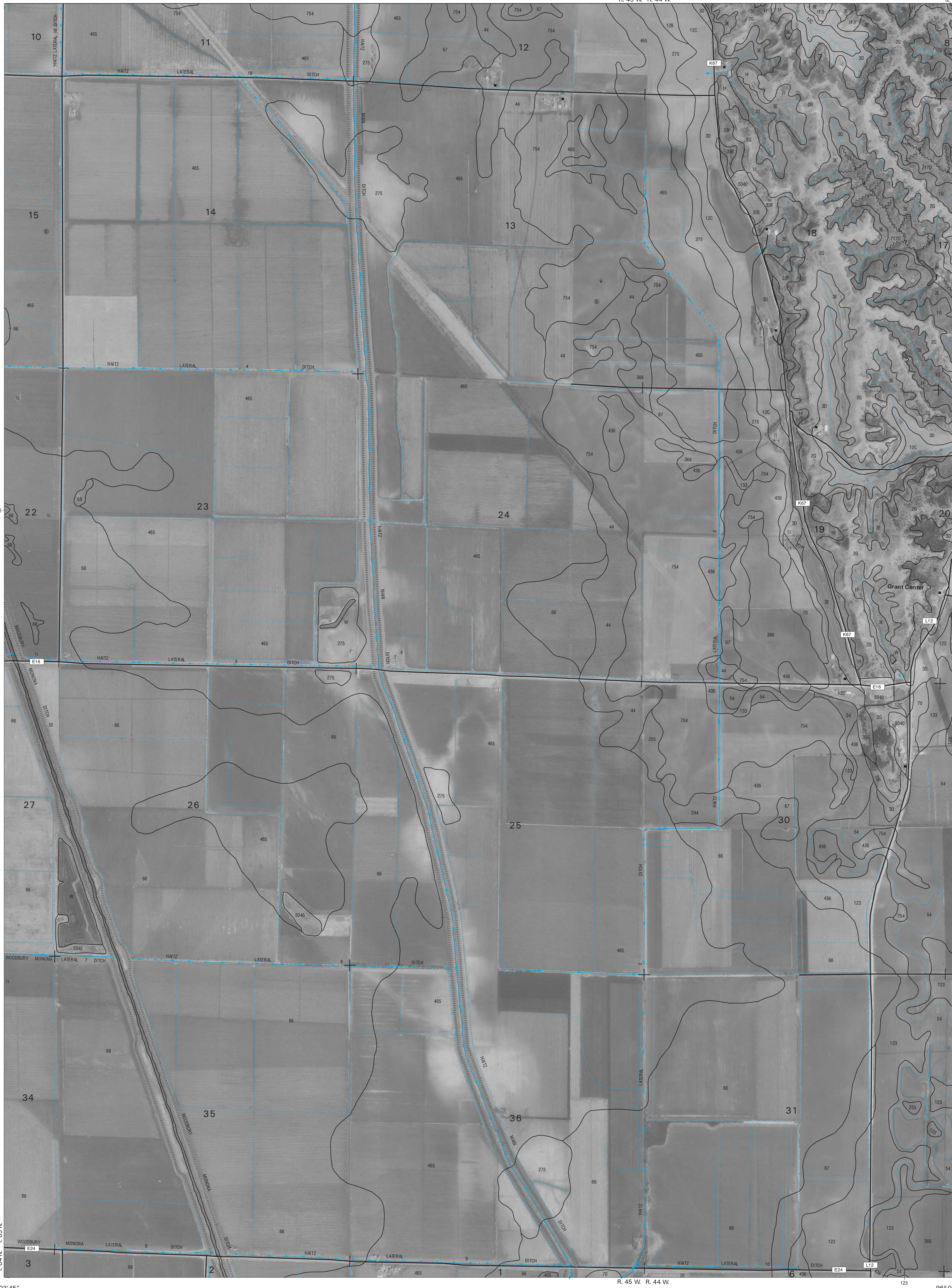
UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MONONA COUNTY, IOWA
HORNICK_SE QUADRANGLE
SHEET NUMBER 18 OF 74

(Joins sheet 6, Hornick_NE)

96° 03' 45" 42° 11' 15"   R. 45 W. R. 44 W.   96° 00' 00" 42° 11' 15"



(Joins sheet 17, Hornick_SW)

(Joins sheet 19, Smithland_SW)

T. 85 N. T. 84 N.

42° 07' 30" 96° 03' 45"   R. 45 W. R. 44 W.   42° 07' 30" 96° 00' 00"

(Joins sheet 29, Onawa_NE)

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH

QUARTER QUADRANGLE LOCATION

SCALE 1:12000

0.5 0 0.5
MILES

500 0 500 1000 1500 2000 2500 3000 3500
FEET

0.5 0 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 HORNICK_NW
2 HORNICK_NE
3 SMITHLAND_NW
4 HORNICK_SW
5 SMITHLAND_SW
6 ONAWA_NW
7 ONAWA_NE
8 CASTANA_NW

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DEPARTMENT OF AGRICULTURE
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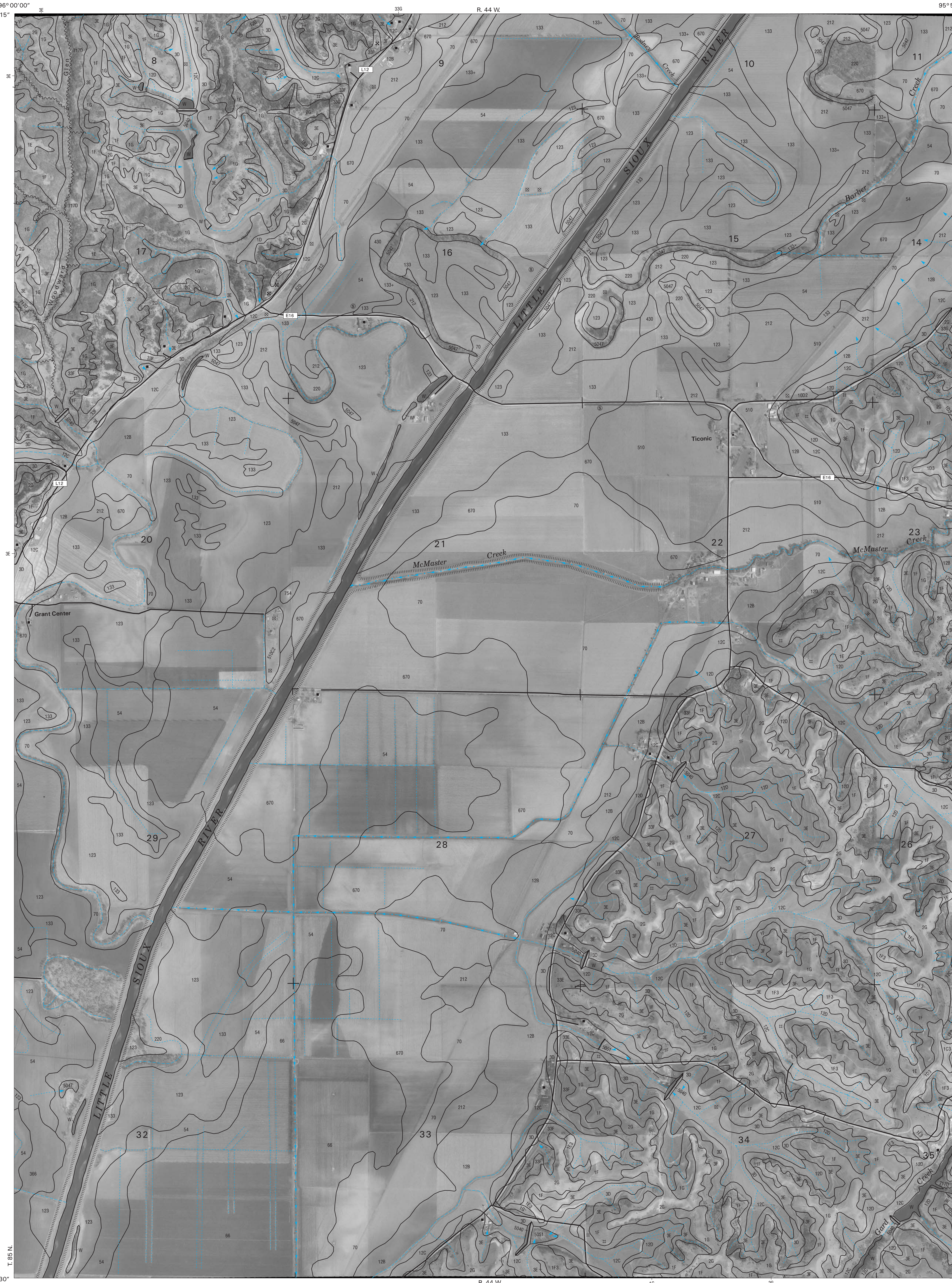
MONONA COUNTY, IOWA
SMITHLAND_SW QUADRANGLE
SHEET NUMBER 19 OF 74

(Joins sheet 7, Smithland_NW)

96° 00′ 00″ 42°11′15″ — R. 44 W. — 95° 56′ 15″ 42°11′15″

(Joins sheet 18, Hornick_SE)



(Joins sheet 20, Smithland_SE)

42° 07′ 30″ 96° 00′ 00″ — R. 44 W. — 42° 07′ 30″ 95° 56′ 15″

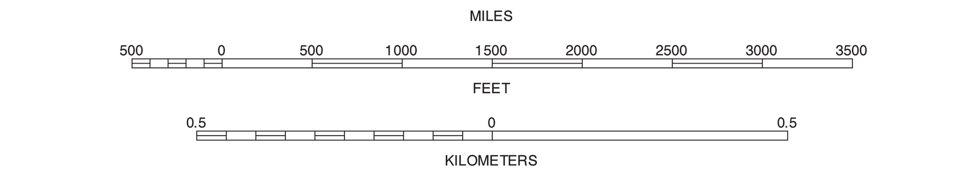
(Joins sheet 30, Castana_NW)

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

QUARTER QUADRANGLE LOCATION

SCALE 1:12000



1	2	3
4		5
6	7	8

1 HORNICK_NE
2 SMITHLAND_NW
3 SMITHLAND_NE
4 HORNICK_SE
5 SMITHLAND_SE
6 ONAWA_NE
7 CASTANA_NW
8 CASTANA_NE

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SMITHLAND_SW, IOWA
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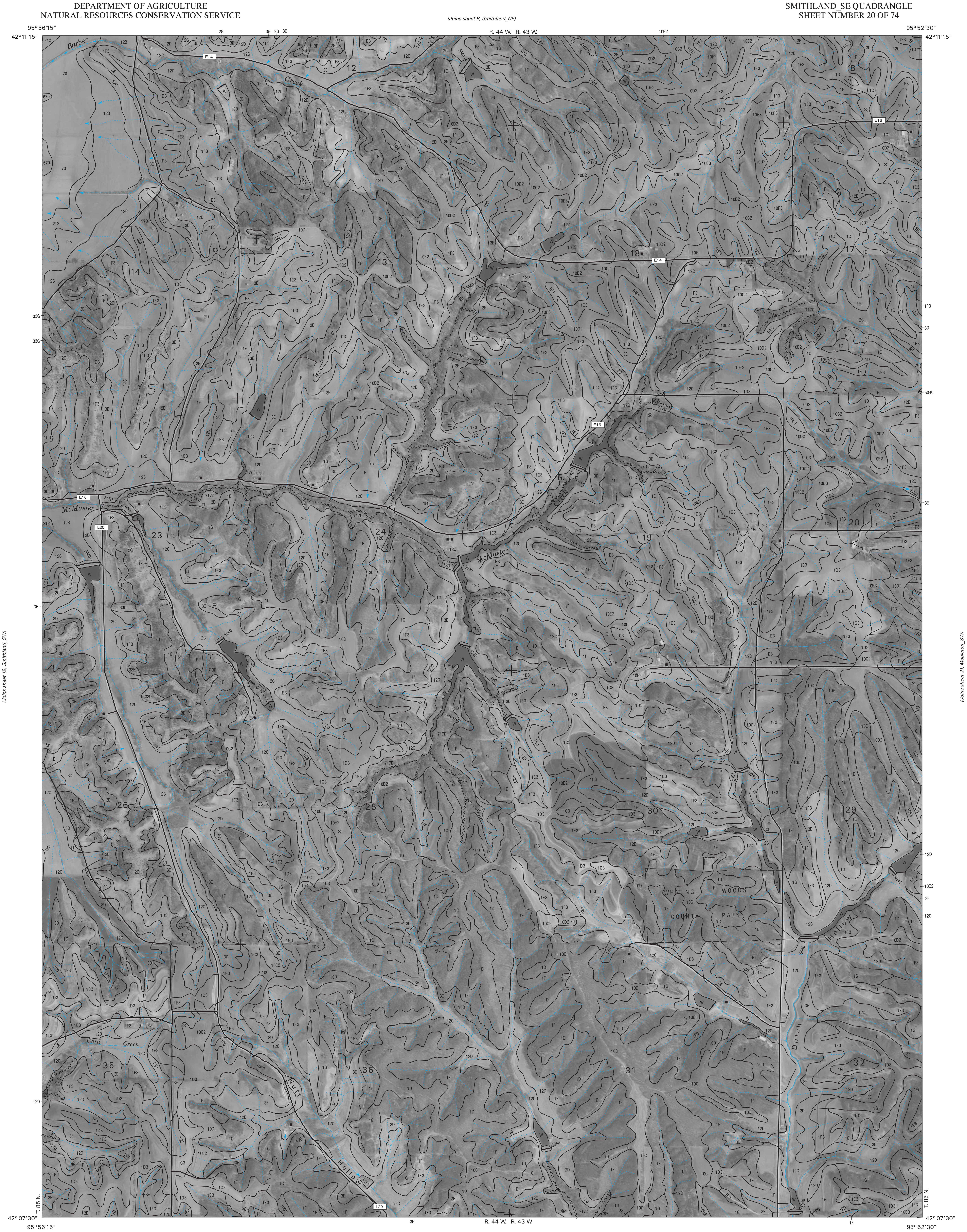
UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MONONA COUNTY, IOWA
SMITHLAND_SE QUADRANGLE
SHEET NUMBER 20 OF 74

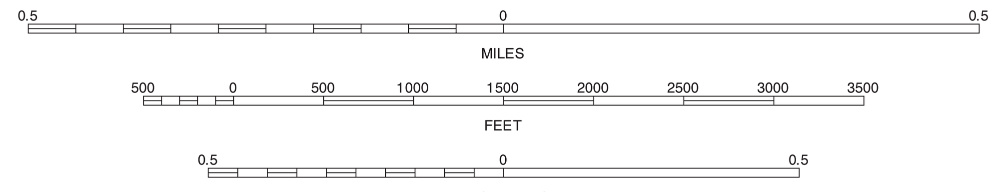


This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

QUARTER QUADRANGLE LOCATION

SCALE 1:12000



1	2	3
4		5
6	7	8

1 SMITHLAND_NW
2 SMITHLAND_NE
3 MAPLETON_NW
4 SMITHLAND_SW
5 MAPLETON_SW
6 CASTANA_NW
7 CASTANA_NE
8 MAPLETON_SE_NW

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UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MONONA COUNTY, IOWA
MAPLETON_SW QUADRANGLE
SHEET NUMBER 21 OF 74

(Joins sheet 9, Mapleton_NW)

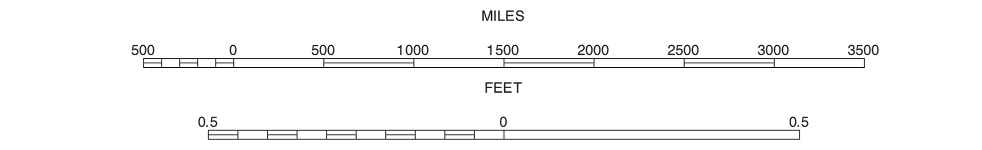
(Joins sheet 32, Mapleton_SE_NW)

SCALE 1:12000

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

QUARTER QUADRANGLE LOCATION



1	2	3
4		5
6	7	8

1 SMITHLAND_NE
2 MAPLETON_NW
3 MAPLETON_NE
4 SMITHLAND_SE
5 MAPLETON_SE
6 CASTANA_NE
7 MAPLETON_SE_NW
8 MAPLETON_SE_NE

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UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MONONA COUNTY, IOWA
MAPLETON_SE QUADRANGLE
SHEET NUMBER 22 OF 74

(Joins sheet 10, Mapleton_NE)

95° 48′ 45″ 42° 11′ 15″ R. 43 W. R. 42 W. 95° 45′ 00″ 42° 11′ 15″

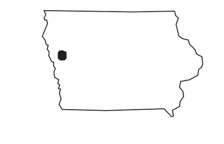
(Joins sheet 21, Mapleton_SW) T. 85 N. (Joins sheet 23, Danbury_SW)

42° 07′ 30″ 95° 48′ 45″ R. 43 W. R. 42 W. 42° 07′ 30″ 95° 45′ 00″

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH



QUARTER QUADRANGLE LOCATION

(Joins sheet 33, Mapleton_SE_NE)

SCALE 1:12000

0.5 0 0.5
MILES

500 0 500 1000 1500 2000 2500 3000 3500
FEET

0.5 0 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 MAPLETON_NW
2 MAPLETON_NE
3 DANBURY_NW
4 MAPLETON_SW
5 DANBURY_SW
6 MAPLETON_SE_NW
7 MAPLETON_SE_NE
8 UTE_NW

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UNITED STATES
DEPARTMENT OF AGRICULTURE
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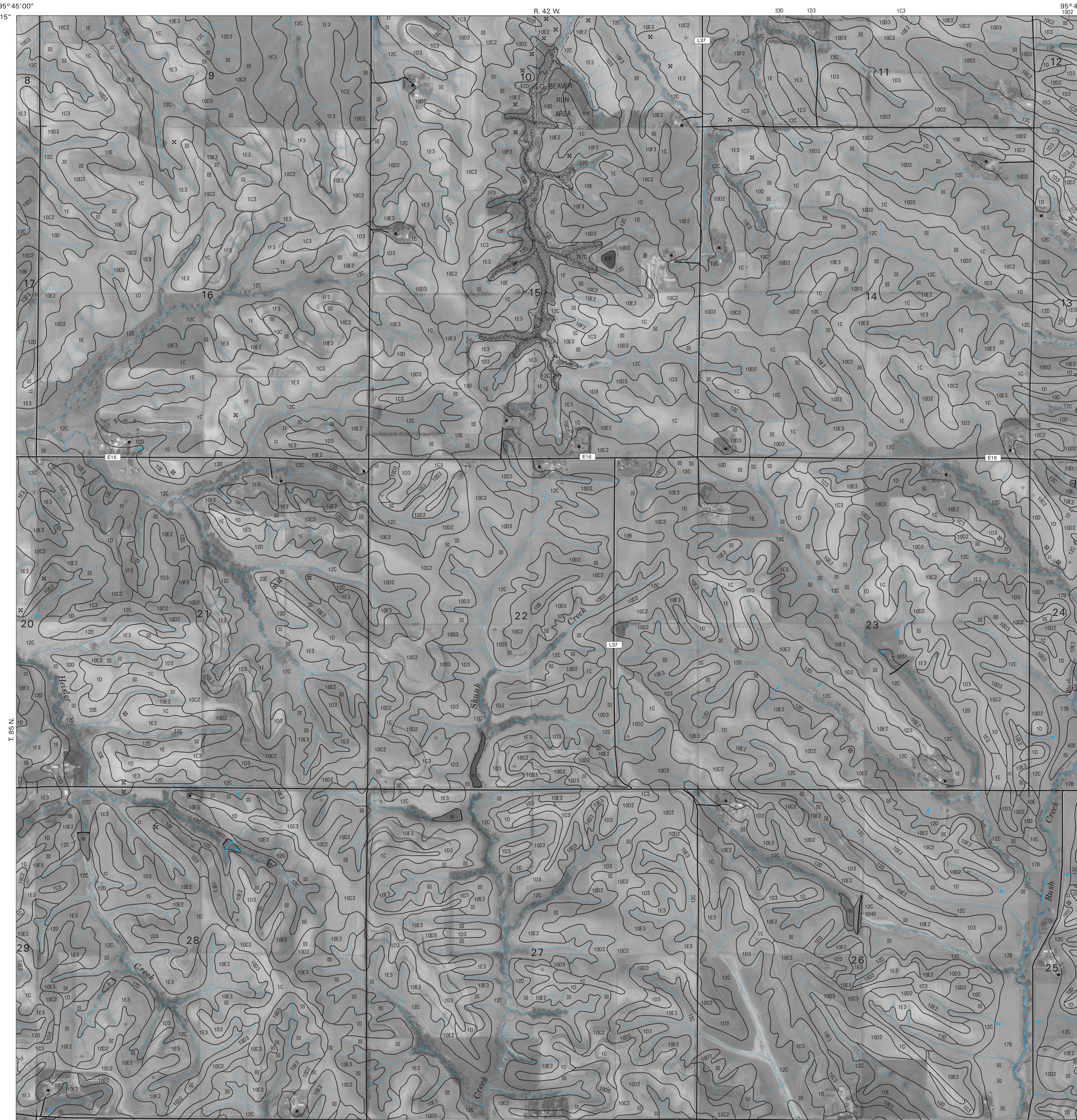
MONONA COUNTY, IOWA
DANBURY_SW QUADRANGLE
SHEET NUMBER 23 OF 74

(Joins sheet 11, Danbury_NW)

(Joins sheet 22, Mapleton_SE)

(Joins sheet 24, Danbury_SE)



(Joins sheet 34, Ute_NW)

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH

QUARTER QUADRANGLE LOCATION

SCALE 1:12000

0.5 0 0.5
MILES

500 0 500 1000 1500 2000 2500 3000 3500
FEET

0.5 0 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 MAPLETON_NE
2 DANBURY_NW
3 DANBURY_NE
4 MAPLETON_SE
5 DANBURY_SE
6 MAPLETON_SE_NE
7 UTE_NW
8 UTE_NE

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UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MONONA COUNTY, IOWA
DANBURY_SE QUADRANGLE
SHEET NUMBER 24 OF 74

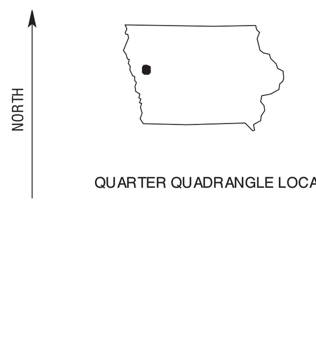
(Joins sheet 12, Danbury_NE)

(Joins sheet 23, Danbury_SW)

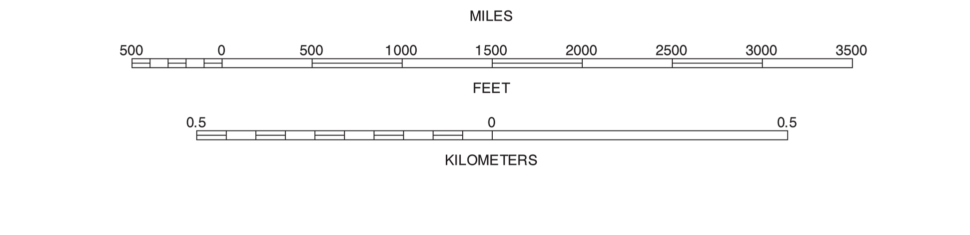
(Joins sheet 35, Ute_NE)

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.



SCALE 1:12000



1	2	3
4		5
6	7	8

1 DANBURY_NW
2 DANBURY_NE
3 RICKETTS_NW
4 DANBURY_SW
5 RICKETTS_SW
6 UTE_NW
7 UTE_NE
8 CHARTER_OAK_NW

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UNITED STATES
DEPARTMENT OF AGRICULTURE
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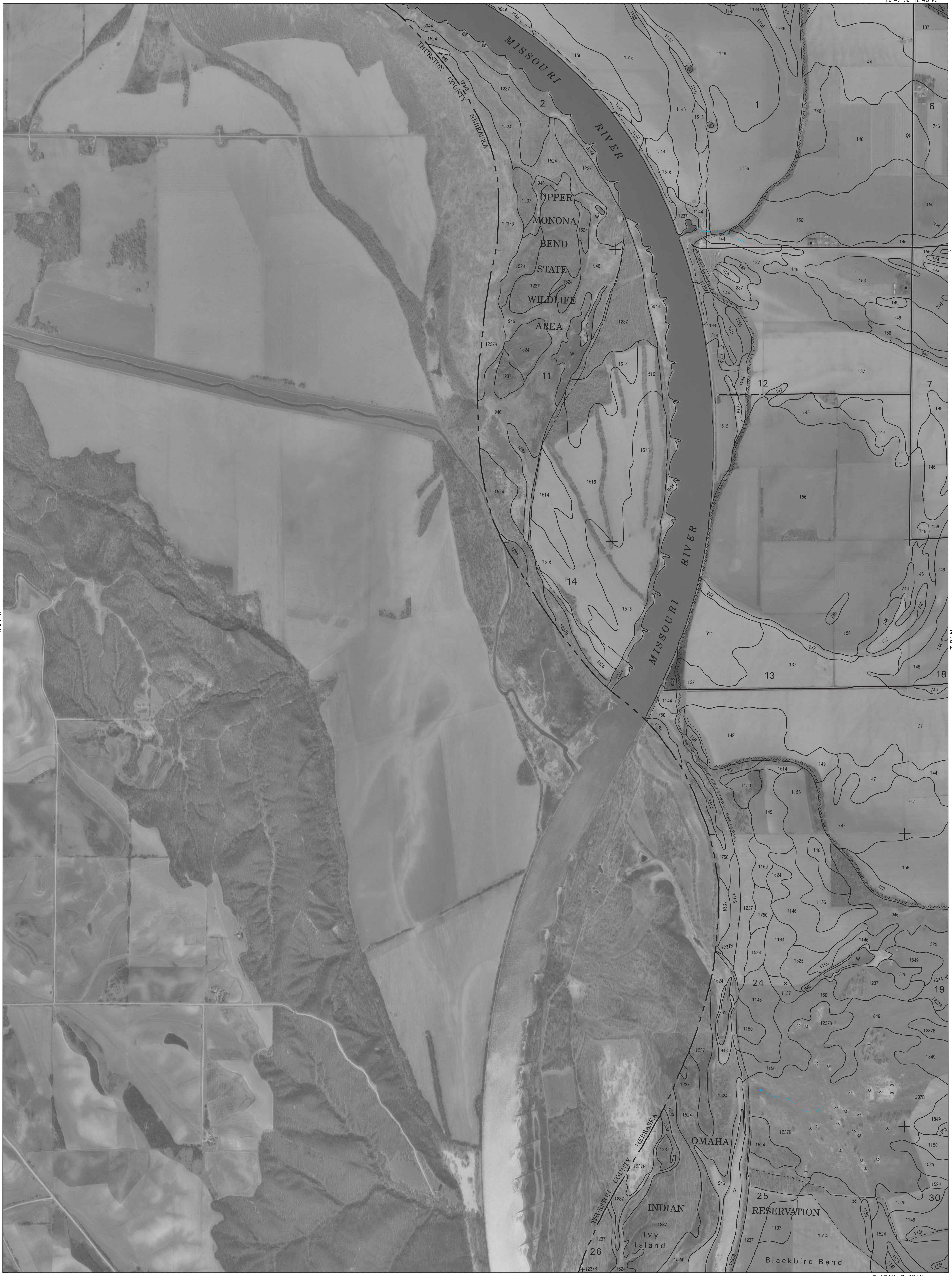
MONONA COUNTY, IOWA
MACY_NE QUADRANGLE
SHEET NUMBER 25 OF 74

(Joins sheet 14, Albaton_SE)



(Joins sheet 26, Onawa_SW_NW)

(Joins sheet 36, Macy_SE)

SCALE 1:12000

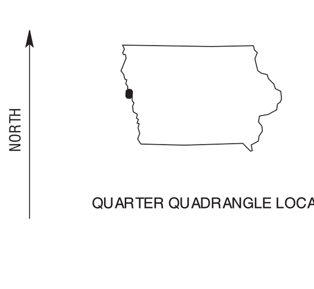
MILES: 0.5 — 0 — 0.5

FEET: 500 — 0 — 500 — 1000 — 1500 — 2000 — 2500 — 3000 — 3500

KILOMETERS: 0.5 — 0 — 0.5

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.



QUARTER QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

1 ALBATON_SW
2 ALBATON_SE
3 SLOAN_SW
4 MACY_NW
5 ONAWA_SW_NW
6 MACY_SW
7 MACY_SE
8 ONAWA_SW_SW

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MACY_NE, IOWA
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SHEET NUMBER 25 OF 74

UNITED STATES
DEPARTMENT OF AGRICULTURE
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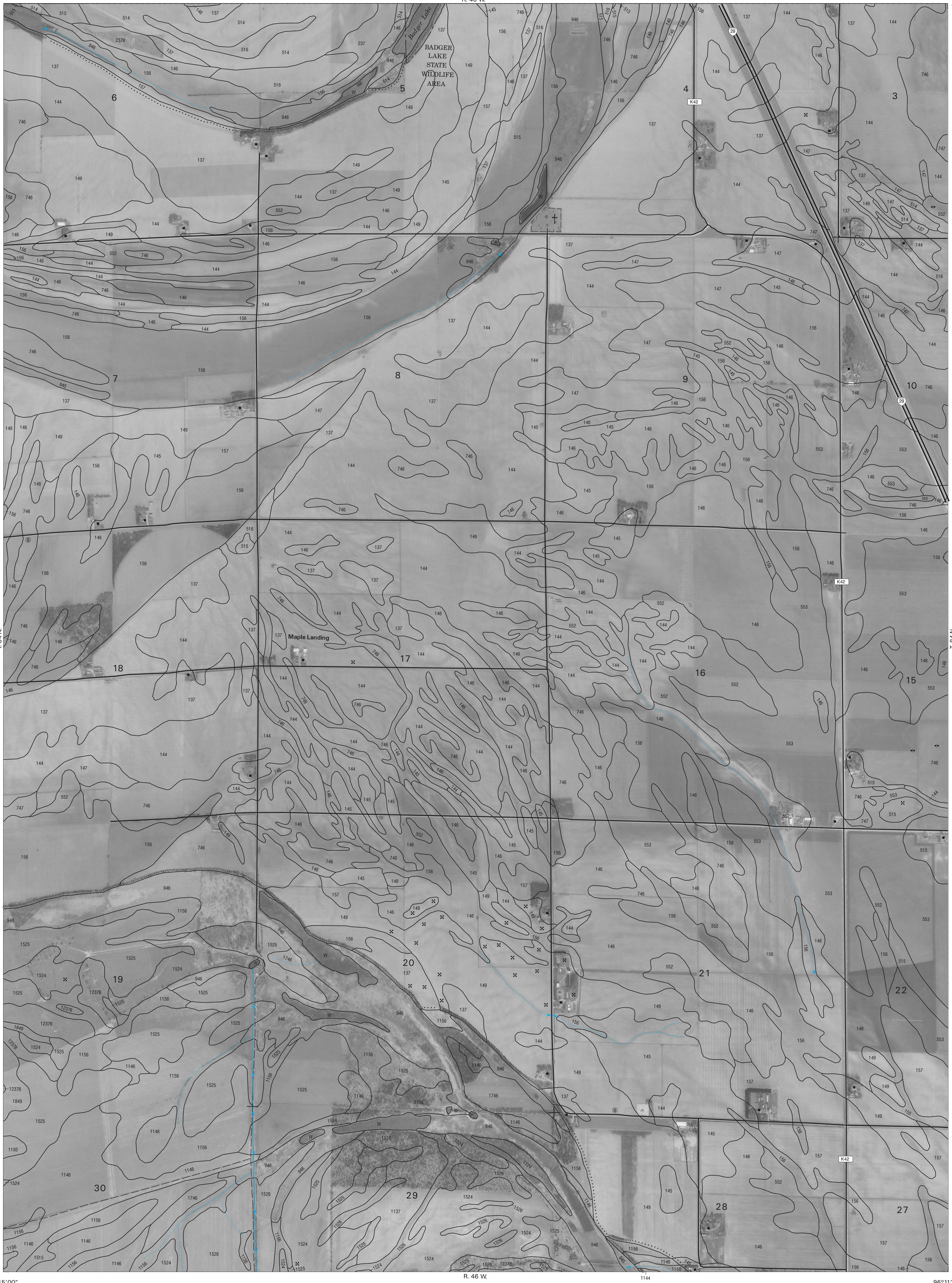
MONONA COUNTY, IOWA
ONAWA_SW_NW QUADRANGLE
SHEET NUMBER 26 OF 74

(Joins sheet 15, Sloan_SW)

96°15′00″ 42°07′30″ — 96°11′15″ 42°07′30″



42°03′45″ 96°15′00″ — 42°03′45″ 96°11′15″

(Joins sheet 25, Macy_NE)

(Joins sheet 27, Onawa_SW_NE)

R. 46 W.

(Joins sheet 37, Onawa_SW_SW)

SCALE 1:12000

MILES: 0.5 — 0 — 0.5

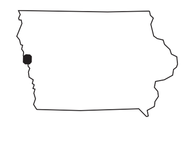
FEET: 500 — 0 — 500 — 1000 — 1500 — 2000 — 2500 — 3000 — 3500

KILOMETERS: 0.5 — 0 — 0.5

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH



QUARTER QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

1 ALBATON_SE
2 SLOAN_SW
3 SLOAN_SE
4 MACY_NE
5 ONAWA_SW_NE
6 MACY_SE
7 ONAWA_SW_SW
8 ONAWA_SW_SE

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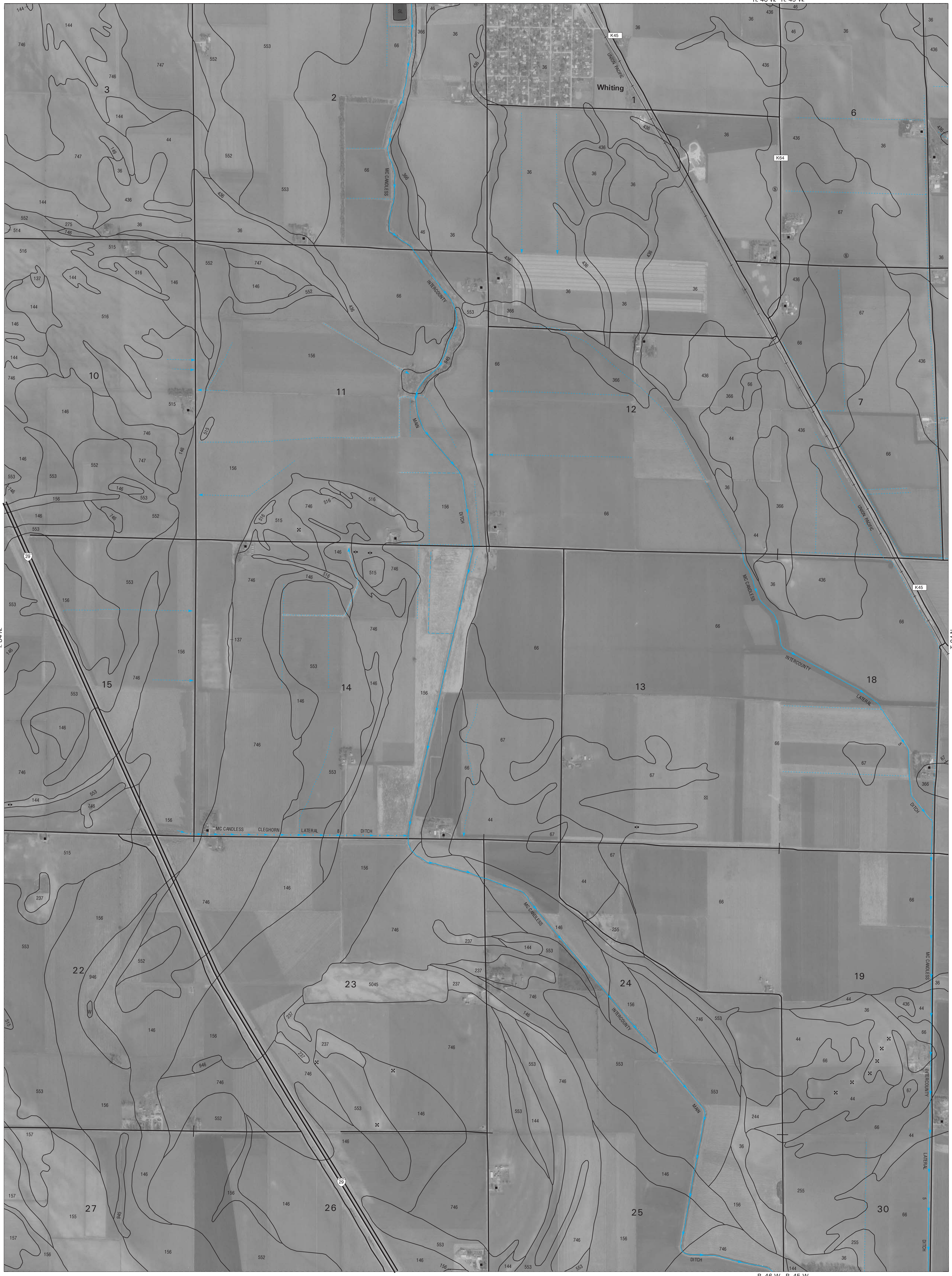
SHEET NUMBER 26 OF 74

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

(Joins sheet 16, Sloan_SE)

96° 11′15″ 42° 07′30″ — R. 46 W. R. 45 W. — 96° 07′30″ 42° 07′30″

(Joins sheet 26, Onawa_SW_NW) T. 84 N. — T. 84 N. (Joins sheet 28, Onawa_NW)



42° 03′45″ 96° 11′15″ — R. 46 W. R. 45 W. — 42° 03′45″ 96° 07′30″

(Joins sheet 38, Onawa_SW_SE)

SCALE 1:12000

MILES 0.5 0 0.5
FEET 500 0 500 1000 1500 2000 2500 3000 3500
KILOMETERS 0.5 0 0.5

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

QUARTER QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

1 SLOAN_SW
2 SLOAN_SE
3 HORNICK_SW
4 ONAWA_SW_NW
5 ONAWA_NW
6 ONAWA_SW_SW
7 ONAWA_SW_SE
8 ONAWA_SW

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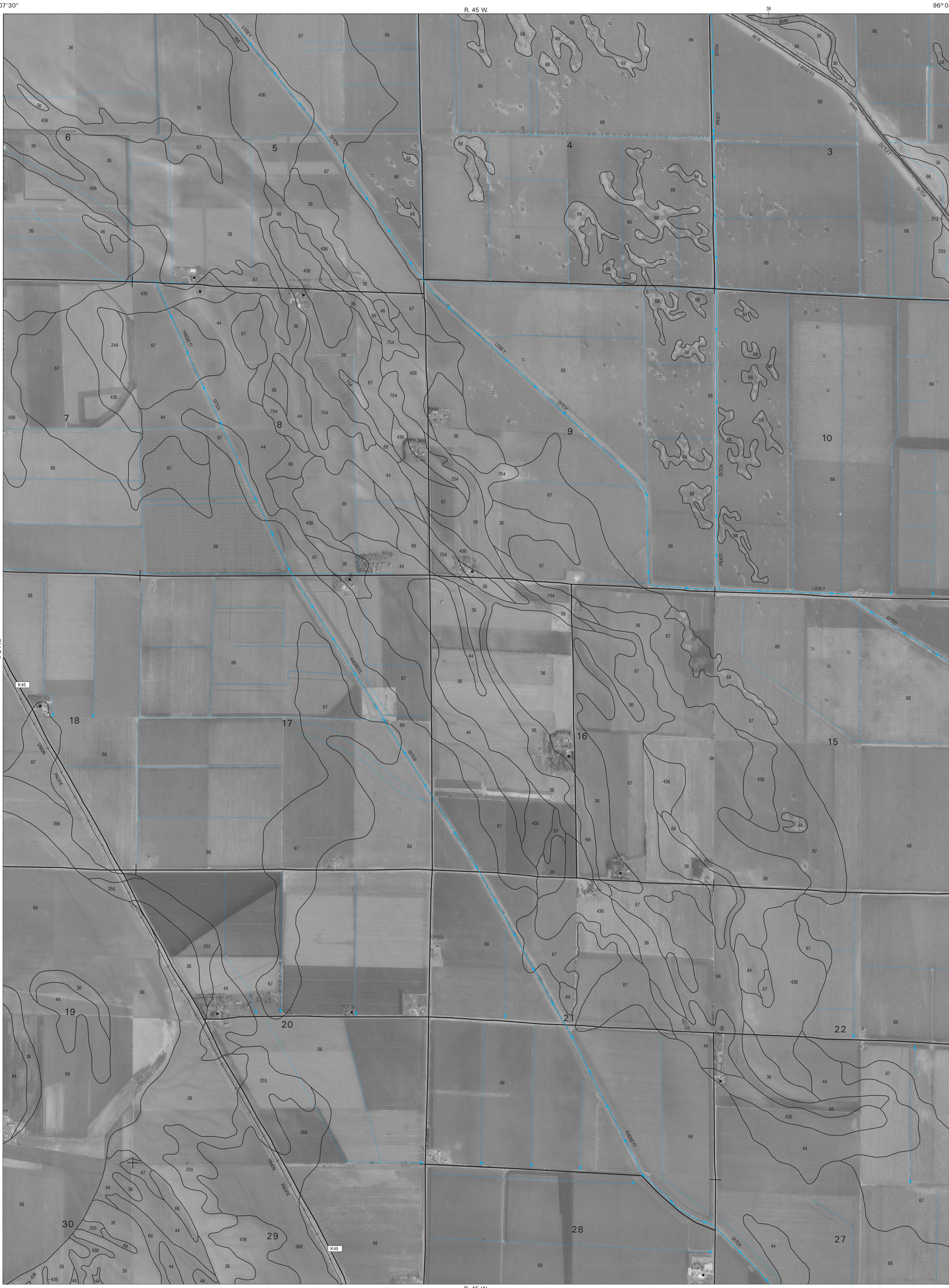
(Joins sheet 17, Hornick_SW)

96° 07′30″ 42° 07′30″ R. 45 W. 96° 03′45″ 42° 07′30″

(Joins sheet 27, Onawa_SW_NE) T. 84 N.



T. 84 N. (Joins sheet 29, Onawa_NE)

42° 03′45″ 96° 07′30″ R. 45 W. 42° 03′45″ 96° 03′45″

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH

QUARTER QUADRANGLE LOCATION

(Joins sheet 39, Onawa_SW)

SCALE 1:12000

0.5 0 0.5
MILES

500 0 500 1000 1500 2000 2500 3000 3500
FEET

0.5 0 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 SLOAN_SE
2 HORNICK_SW
3 HORNICK_SE
4 ONAWA_SW_NE
5 ONAWA_NE
6 ONAWA_SW_SE
7 ONAWA_SW
8 ONAWA_SE

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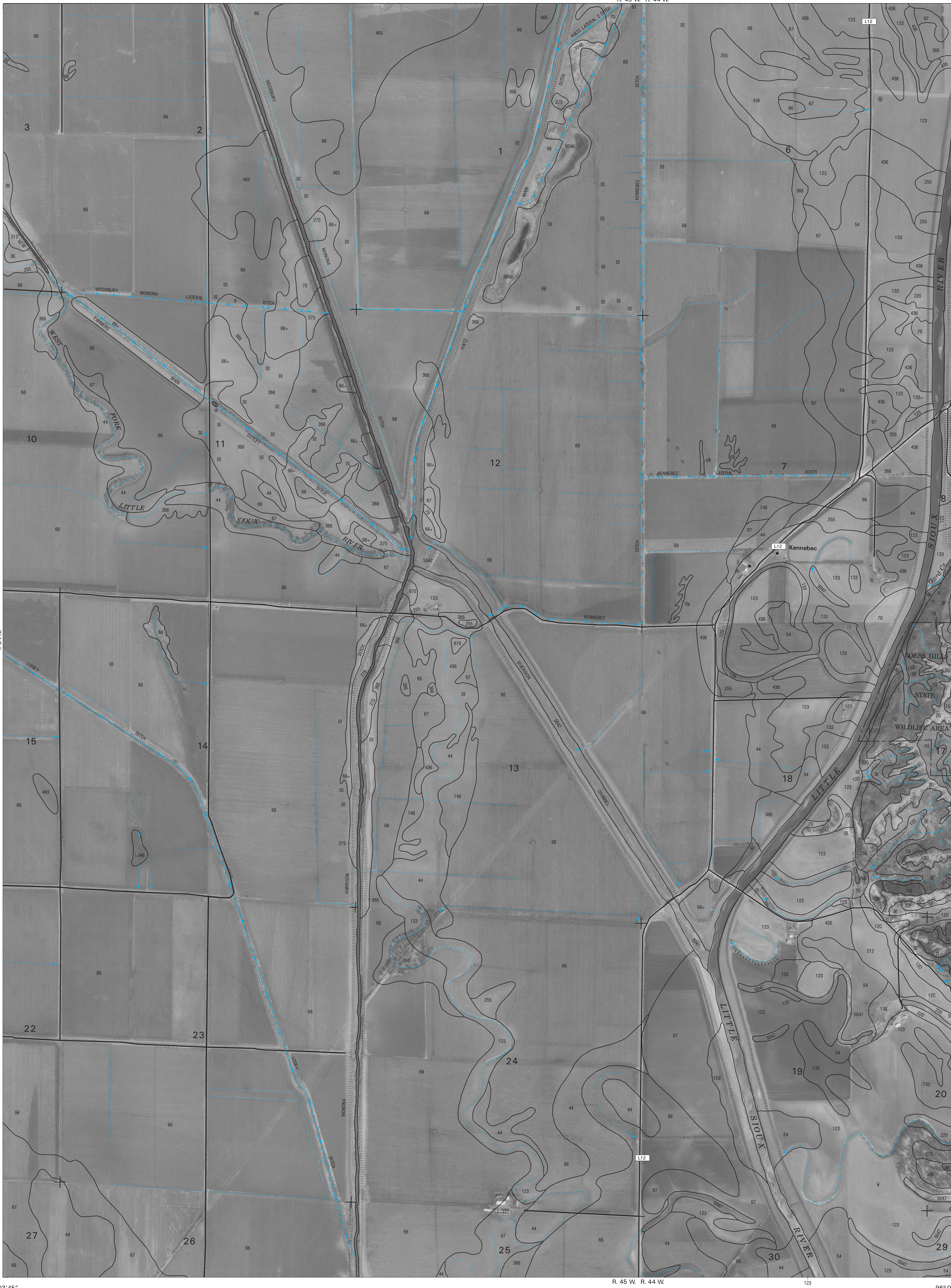
MONONA COUNTY, IOWA
ONAWA_NE QUADRANGLE
SHEET NUMBER 29 OF 74

(Joins sheet 18, Hornick_SE)

96° 03′45″ 42° 07′30″ | R. 45 W. R. 44 W. | 96° 00′00″ 42° 07′30″

(Joins sheet 28, Onawa_NW) | T. 84 N. | (Joins sheet 30, Castana_NW)



42° 03′45″ 96° 03′45″ | R. 45 W. R. 44 W. | 42° 03′45″ 96° 00′00″

(Joins sheet 40, Onawa_SE)

SCALE 1:12000

MILES: 0.5 0 0.5
FEET: 500 0 500 1000 1500 2000 2500 3000 3500
KILOMETERS: 0.5 0 0.5

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH

QUARTER QUADRANGLE LOCATION

1 HORNICK_SW
2 HORNICK_SE
3 SMITHLAND_SW
4 ONAWA_NW
5 CASTANA_NW
6 ONAWA_SW
7 ONAWA_SE
8 CASTANA_SW

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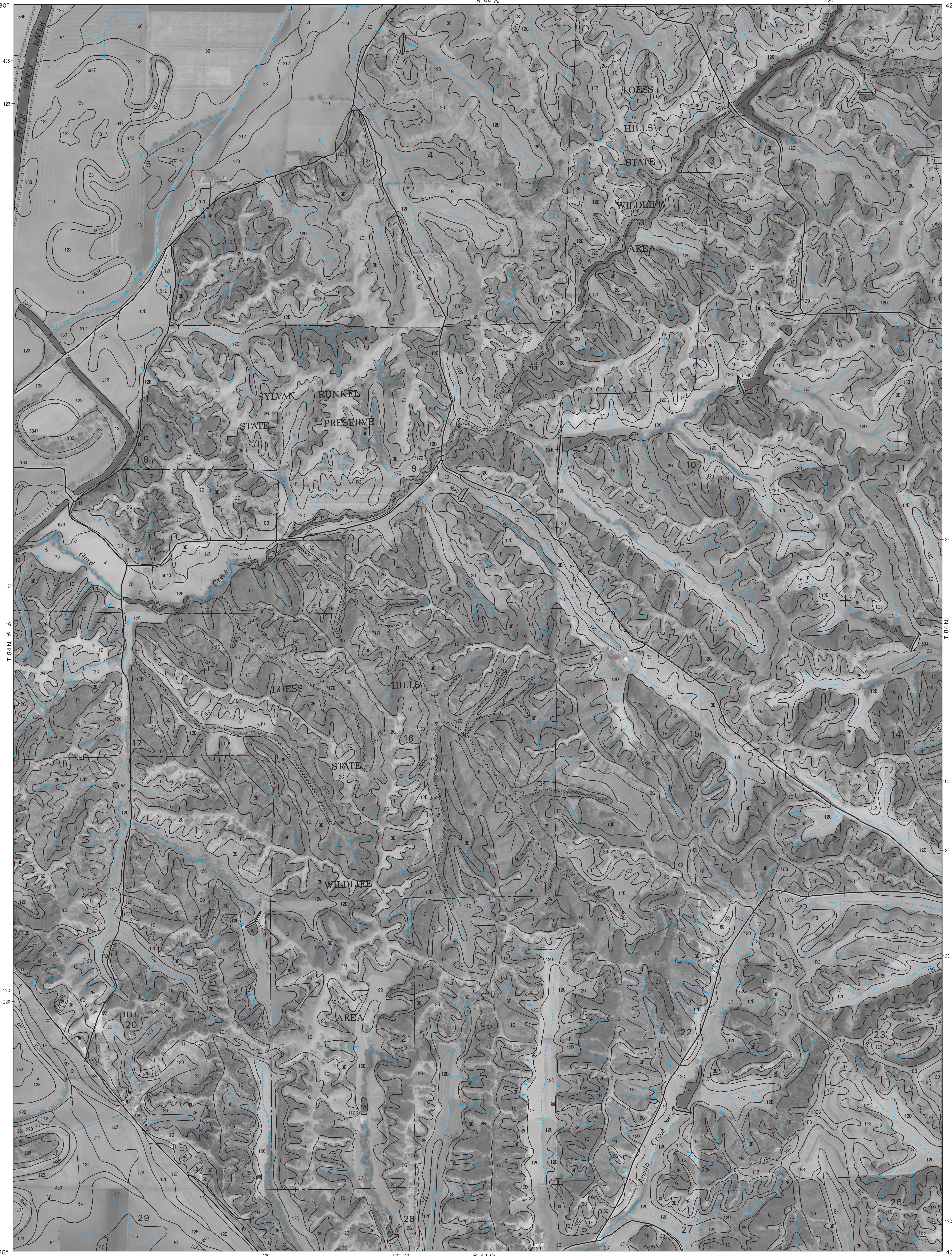
MONONA COUNTY, IOWA
CASTANA_NW QUADRANGLE
SHEET NUMBER 30 OF 74

(Joins sheet 19, Smithland_SW)



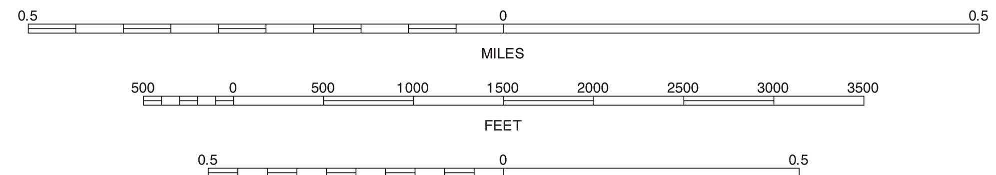
(Joins sheet 41, Castana_SW)

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

QUARTER QUADRANGLE LOCATION

SCALE 1:12000



1	2	3
4		5
6	7	8

1 HORNICK_SE
2 SMITHLAND_SW
3 SMITHLAND_SE
4 ONAWA_NE
5 CASTANA_NE
6 ONAWA_SE
7 CASTANA_SW
8 CASTANA_SE

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MONONA COUNTY, IOWA
CASTANA_NE QUADRANGLE
SHEET NUMBER 31 OF 74

(Joins sheet 20, Smithland_SE)

95° 56′15″ 42° 07′30″ R. 44 W. R. 43 W. 95° 52′30″ 42° 07′30″

(Joins sheet 30, Castana_NW) T. 84 N.

T. 84 N. (Joins sheet 32, Mapleton_SE_NW)

42° 03′45″ 95° 56′15″ R. 44 W. R. 43 W. 42° 03′45″ 95° 52′30″

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH

QUARTER QUADRANGLE LOCATION

(Joins sheet 42, Castana_SE)

SCALE 1:12000

0.5 0 0.5 MILES

500 0 500 1000 1500 2000 2500 3000 3500 FEET

0.5 0 0.5 KILOMETERS

1	2	3
4		5
6	7	8

1 SMITHLAND_SW
2 SMITHLAND_SE
3 MAPLETON_SW
4 CASTANA_NW
5 MAPLETON_SE_NW
6 CASTANA_SW
7 CASTANA_SE
8 MAPLETON_SE_SW

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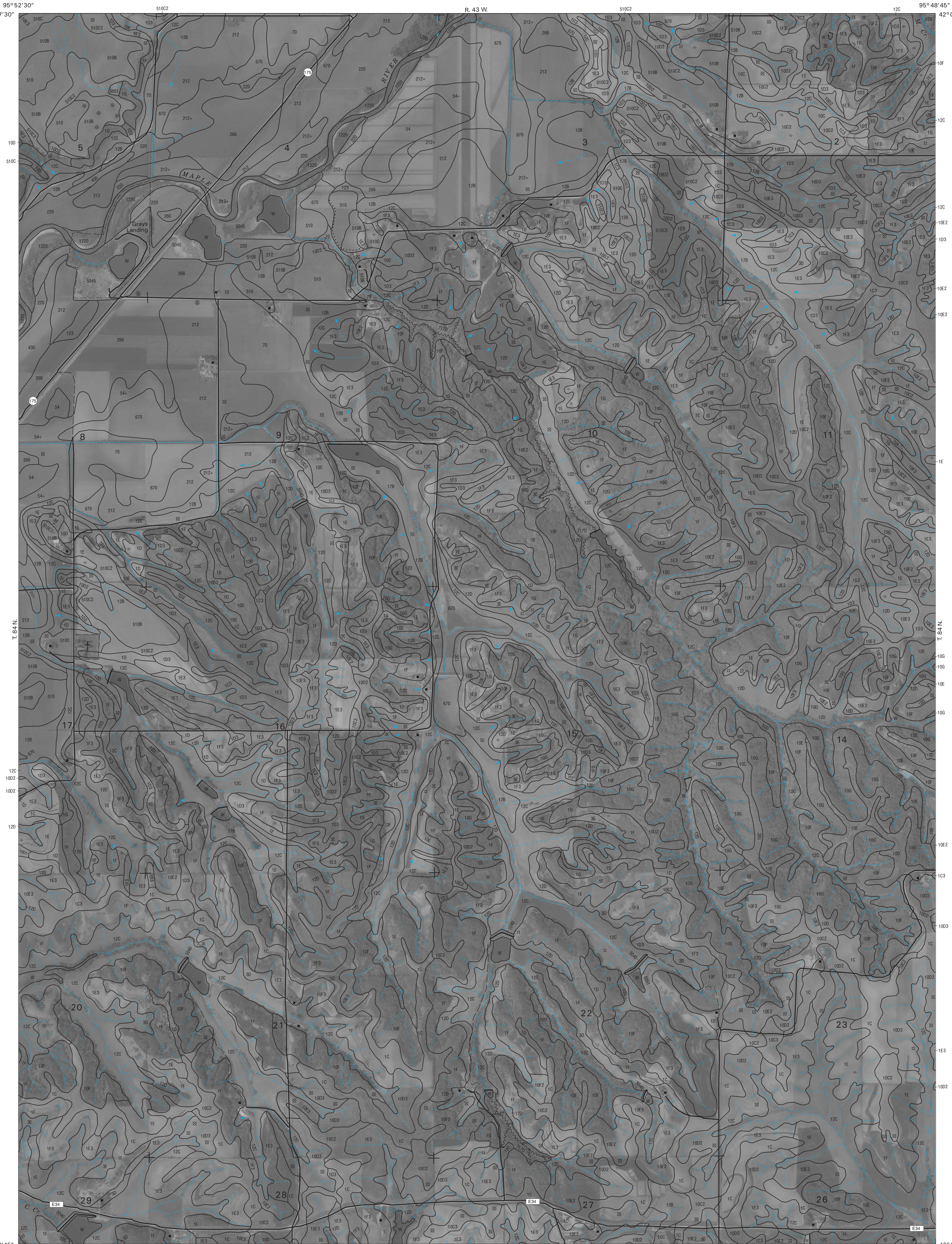
MONONA COUNTY, IOWA
MAPLETON_SE_NW QUADRANGLE
SHEET NUMBER 32 OF 74

(Joins sheet 21, Mapleton_SW)

95° 52′30″ 42° 07′30″ — 95° 48′45″ 42° 07′30″

(Joins sheet 31, Castana_NE)

(Joins sheet 33, Mapleton_SE_NE)



42° 03′45″ 95° 52′30″ — 42° 03′45″ 95° 48′45″

(Joins sheet 43, Mapleton_SE_SW)

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH

QUARTER QUADRANGLE LOCATION

SCALE 1:12000

MILES: 0.5 — 0 — 0.5

FEET: 500 — 0 — 500 — 1000 — 1500 — 2000 — 2500 — 3000 — 3500

KILOMETERS: 0.5 — 0 — 0.5

1	2	3
4		5
6	7	8

1 SMITHLAND_SE
2 MAPLETON_SW
3 MAPLETON_SE
4 CASTANA_NE
5 MAPLETON_SE_NE
6 CASTANA_SE
7 MAPLETON_SE_SW
8 MAPLETON_SE_SE

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UNITED STATES
DEPARTMENT OF AGRICULTURE
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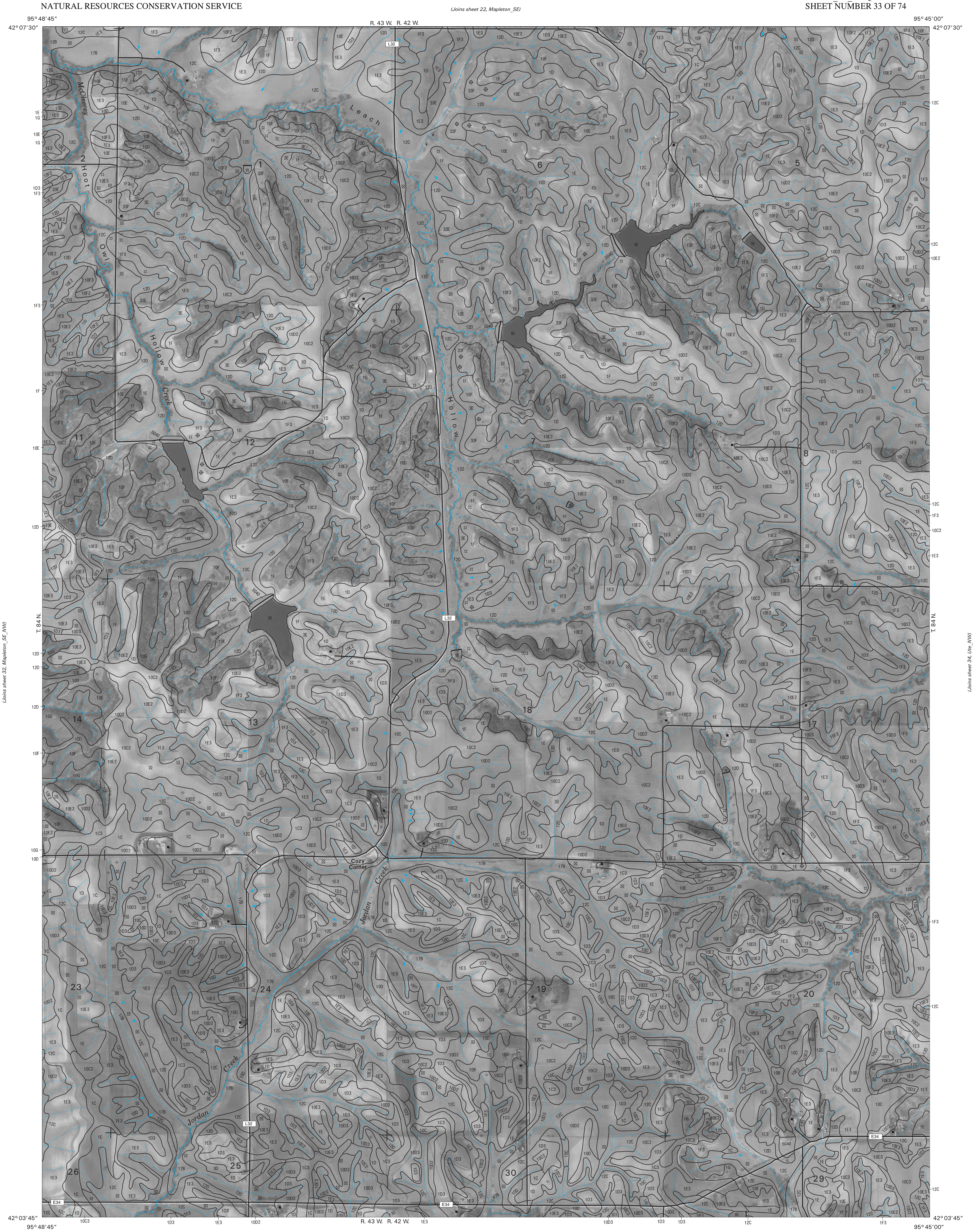
MONONA COUNTY, IOWA
MAPLETON_SE_NE QUADRANGLE
SHEET NUMBER 33 OF 74



This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH

QUARTER QUADRANGLE LOCATION

SCALE 1:12000

0.5 0 0.5
MILES

500 0 500 1000 1500 2000 2500 3000 3500
FEET

0.5 0 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 MAPLETON_SW
2 MAPLETON_SE
3 DANBURY_SW
4 MAPLETON_SE_NW
5 UTE_NW
6 MAPLETON_SE_SW
7 MAPLETON_SE_SE
8 UTE_SW

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MAPLETON_SE_NE, IOWA
3.75 MINUTE SERIES
SHEET NUMBER 33 OF 74

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

(Joins sheet 45, Ute_SW)

SCALE 1:12000

0.5 — 0 — 0.5 MILES

500 — 0 — 500 — 1000 — 1500 — 2000 — 2500 — 3000 — 3500 FEET

0.5 — 0 — 0.5 KILOMETERS

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

QUARTER QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

1 MAPLETON_SE
2 DANBURY_SW
3 DANBURY_SE
4 MAPLETON_SE_NE
5 UTE_NE
6 MAPLETON_SE_SE
7 UTE_SW
8 UTE_SE

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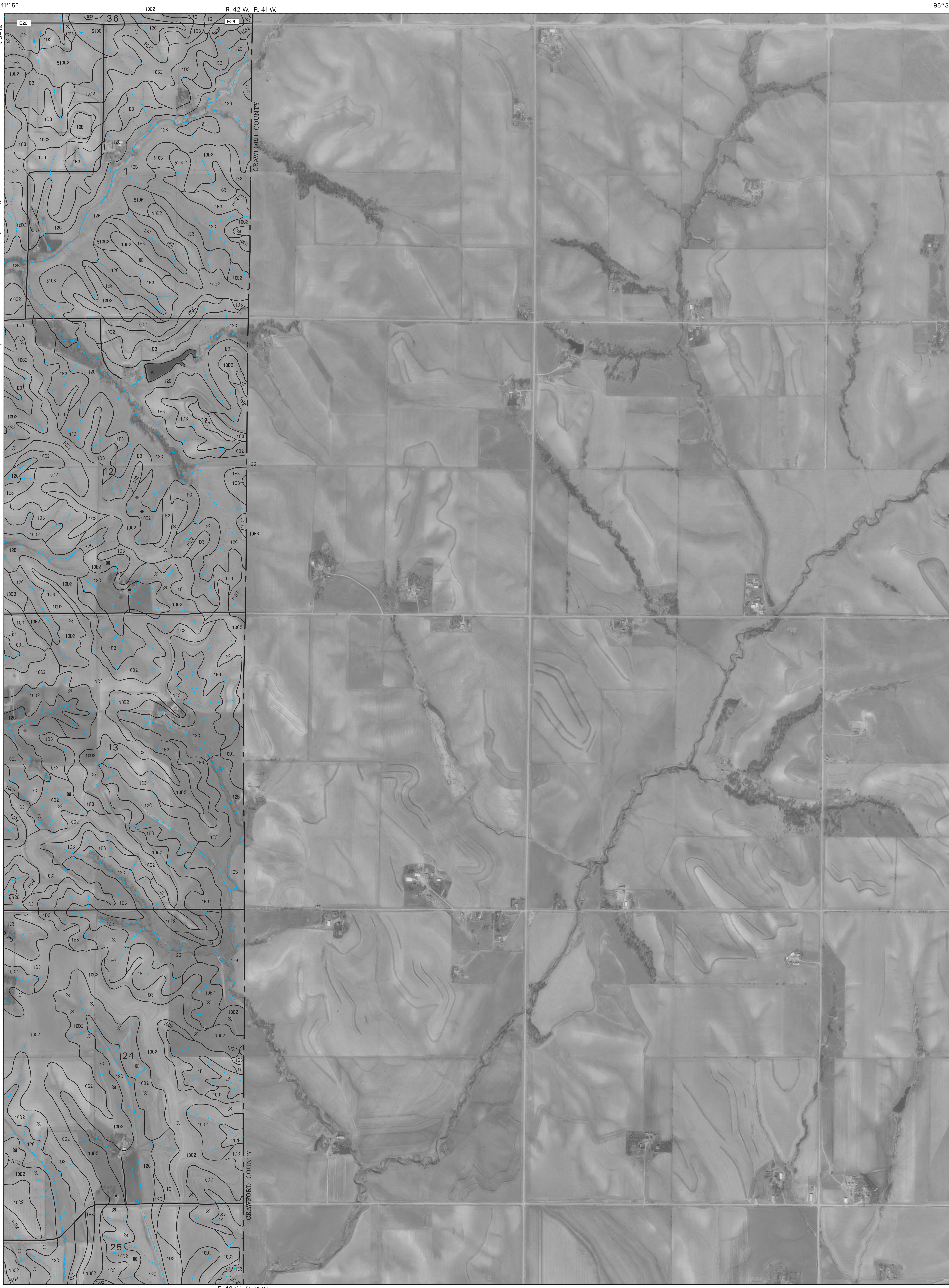
MONONA COUNTY, IOWA
UTE_NE QUADRANGLE
SHEET NUMBER 35 OF 74

(Joins sheet 24, Danbury_SE)

95° 41′15″ 42° 07′30″ R. 42 W. R. 41 W. 95° 37′30″ 42° 07′30″

T. 84 N.



(Joins sheet 34, Ute_NW)

42° 03′45″ 95° 41′15″ R. 42 W. R. 41 W. 42° 03′45″ 95° 37′30″

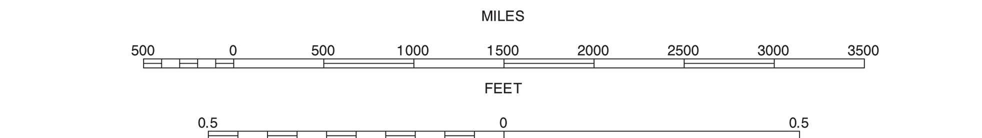
This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

QUARTER QUADRANGLE LOCATION

(Joins sheet 46, Ute_SE)

SCALE 1:12000



1	2	3
4		5
6	7	8

1 DANBURY_SW
2 DANBURY_SE
3 RICKETTS_SW
4 UTE_NW
5 CHARTER_OAK_NW
6 UTE_SW
7 UTE_SE
8 CHARTER_OAK_SW

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MONONA COUNTY, IOWA
MACY_SE QUADRANGLE
SHEET NUMBER 36 OF 74

(Joins sheet 25, Macy_NE)

96°18′45″ 42°03′45″ — R. 47 W. R. 46 W. 96°15′00″ 42°03′45″

(Joins sheet 37, Onawa_SW_SW)

42°00′00″ 96°18′45″ — R. 47 W. R. 46 W. 42°00′00″ 96°15′00″

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

QUARTER QUADRANGLE LOCATION

SCALE 1:12000

0.5 0 0.5
MILES

500 0 500 1000 1500 2000 2500 3000 3500
FEET

0.5 0 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 MACY_NW
2 MACY_NE
3 ONAWA_SW_NW
4 MACY_SW
5 ONAWA_SW_SW
6 BERTHA_NW
7 BERTHA_NE
8 TEKAMAH_NW_NW

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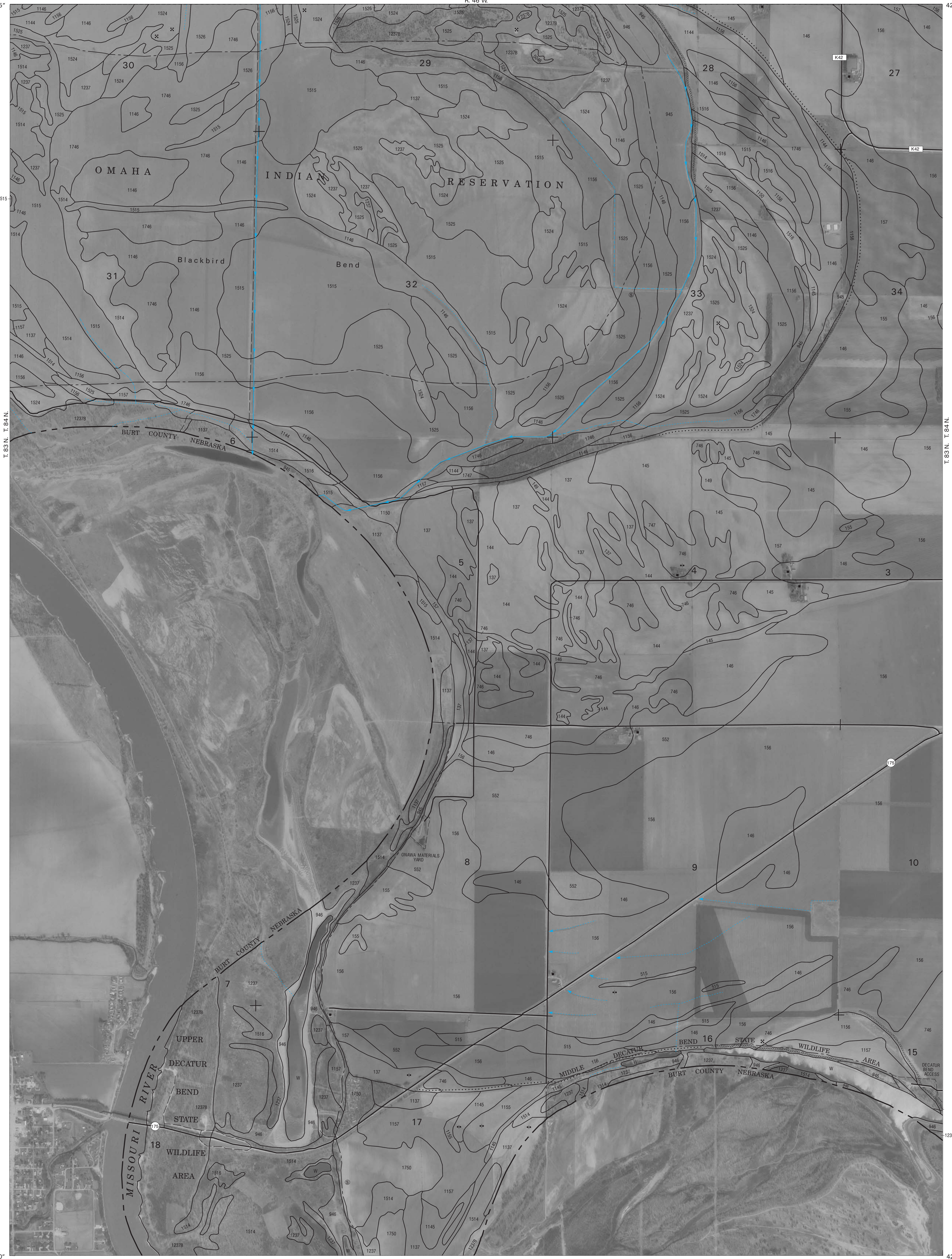
MONONA COUNTY, IOWA
ONAWA_SW_SW QUADRANGLE
SHEET NUMBER 37 OF 74

(Joins sheet 26, Onawa_SW_NW)

96°15′00″ 42°03′45″ — 96°11′15″ 42°03′45″



(Joins sheet 36, Macy_SE)

(Joins sheet 38, Onawa_SW_SE)

42°00′00″ 96°15′00″ — R. 46 W. — 42°00′00″ 96°11′15″

(Joins sheet 47, Tekamah_NW_NW)

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH

QUARTER QUADRANGLE LOCATION

SCALE 1:12000

MILES: 0.5 — 0 — 0.5

FEET: 500 — 0 — 500 — 1000 — 1500 — 2000 — 2500 — 3000 — 3500

KILOMETERS: 0.5 — 0 — 0.5

1	2	3
4		5
6	7	8

1 MACY_NE
2 ONAWA_SW_NW
3 ONAWA_SW_NE
4 MACY_SE
5 ONAWA_SW_SE
6 BERTHA_NE
7 TEKAMAH_NW_NW
8 TEKAMAH_NW_NE

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CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state, or province
- County or parish
- Reservation (national forest or park, state forest or park, and large airport)
- Field sheet matchline and neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, cemetery, or flood pool (FLOOD POOL LINE)

STATE COORDINATE TICK 1 890 000 FEET

LAND DIVISION CORNER (sections and land grants)

GEOGRAPHIC COORDINATE TICK

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate (173)
- State (52)

RAILROAD

LEVEES

- Single side slope (showing actual feature location)

DAMS

- Medium or Small (Named where applicable) (water, w)

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban area) (occupied)
- Church
- School

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent-crossable with tillage implements
- Intermittent-not crossable with tillage implements
- Drainage end
- Canals or ditches
  - Double-line (label) (CANAL)
  - Perennial drainage and/or irrigation ditch
  - Intermittent drainage and/or irrigation ditch

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS (137 144)

- Non-bedrock escarpment

SHORT STEEP SLOPE

GULLY

SOIL SAMPLE (normally not shown)

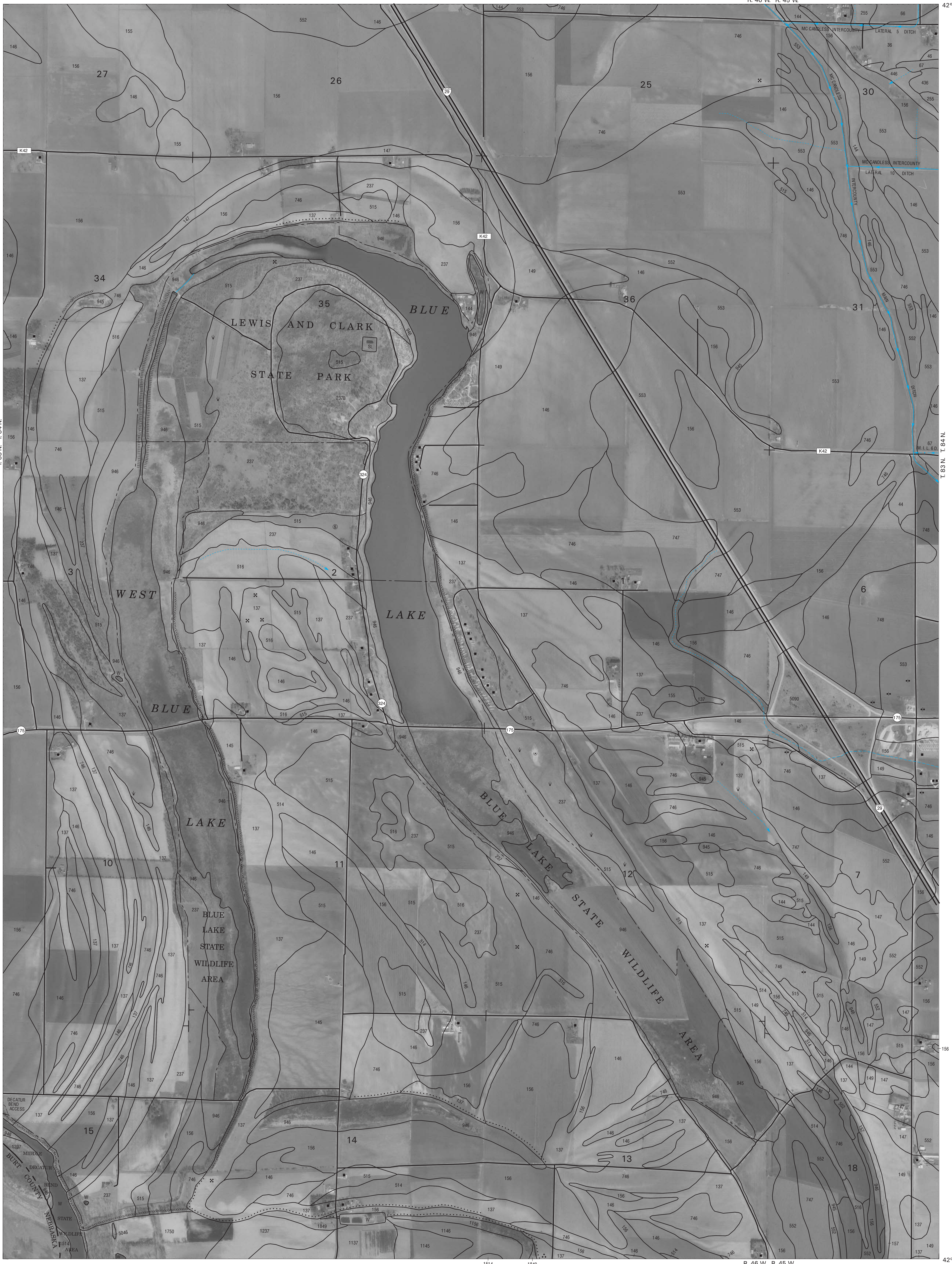
MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Sandy spot
- Severely eroded spot
- Calcareous spot
- Gypsum spot
- Borrow area
- Glacial till spot
- Sandy substratum at a depth of 15-30 inches
- Wet depression silt loam surface

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MONONA COUNTY, IOWA
ONAWA_SW_SE QUADRANGLE
SHEET NUMBER 38 OF 74

(Joins sheet 27, Onawa_SW_NE)



(Joins sheet 37, Onawa_SW_SW)

(Joins sheet 39, Onawa_SW)

(Joins sheet 48, Tekamah_NW_NE)

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH

QUARTER QUADRANGLE LOCATION

SCALE 1:12000

0.5 0 0.5
MILES

500 0 500 1000 1500 2000 2500 3000 3500
FEET

0.5 0 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 ONAWA_SW_NW
2 ONAWA_SW_NE
3 ONAWA_NW
4 ONAWA_SW_SW
5 ONAWA_SW
6 TEKAMAH_NW_NW
7 TEKAMAH_NW_NE
8 BLENCOE_NW

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SHEET NUMBER 38 OF 74

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MONONA COUNTY, IOWA
ONAWA_SW QUADRANGLE
SHEET NUMBER 39 OF 74

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

QUARTER QUADRANGLE LOCATION

SCALE 1:12000

0.5 0 0.5
MILES

500 0 500 1000 1500 2000 2500 3000 3500
FEET

0.5 0 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 ONAWA_SW_NE
2 ONAWA_NW
3 ONAWA_NE
4 ONAWA_SW_SE
5 ONAWA_SE
6 TEKAMAH_NW_NE
7 BLENCOE_NW
8 BLENCOE_NE

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ONAWA_SW, IOWA
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DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MONONA COUNTY, IOWA
ONAWA_SE QUADRANGLE
SHEET NUMBER 40 OF 74

(Joins sheet 29, Onawa_NE)

96° 03′45″ 42° 03′45″ R. 45 W. R. 44 W. 96° 00′00″ 42° 03′45″

(Joins sheet 39, Onawa_SW) T. 83 N. T. 84 N.

T. 83 N. T. 84 N. (Joins sheet 41, Castana_SW)

42° 00′00″ 96° 03′45″ R. 45 W. R. 44 W. 42° 00′00″ 96° 00′00″

(Joins sheet 50, Blencoe_NE)

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH

QUARTER QUADRANGLE LOCATION

SCALE 1:12000

MILES: 0.5 0 0.5

FEET: 500 0 500 1000 1500 2000 2500 3000 3500

KILOMETERS: 0.5 0 0.5

1 ONAWA_NW
2 ONAWA_NE
3 CASTANA_NW
4 ONAWA_SW
5 CASTANA_SW
6 BLENCOE_NW
7 BLENCOE_NE
8 MOORHEAD_NW_NW

INDEX TO ADJOINING 3.75 MAPS

ONAWA_SE, IOWA
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SHEET NUMBER 40 OF 74

UNITED STATES
DEPARTMENT OF AGRICULTURE
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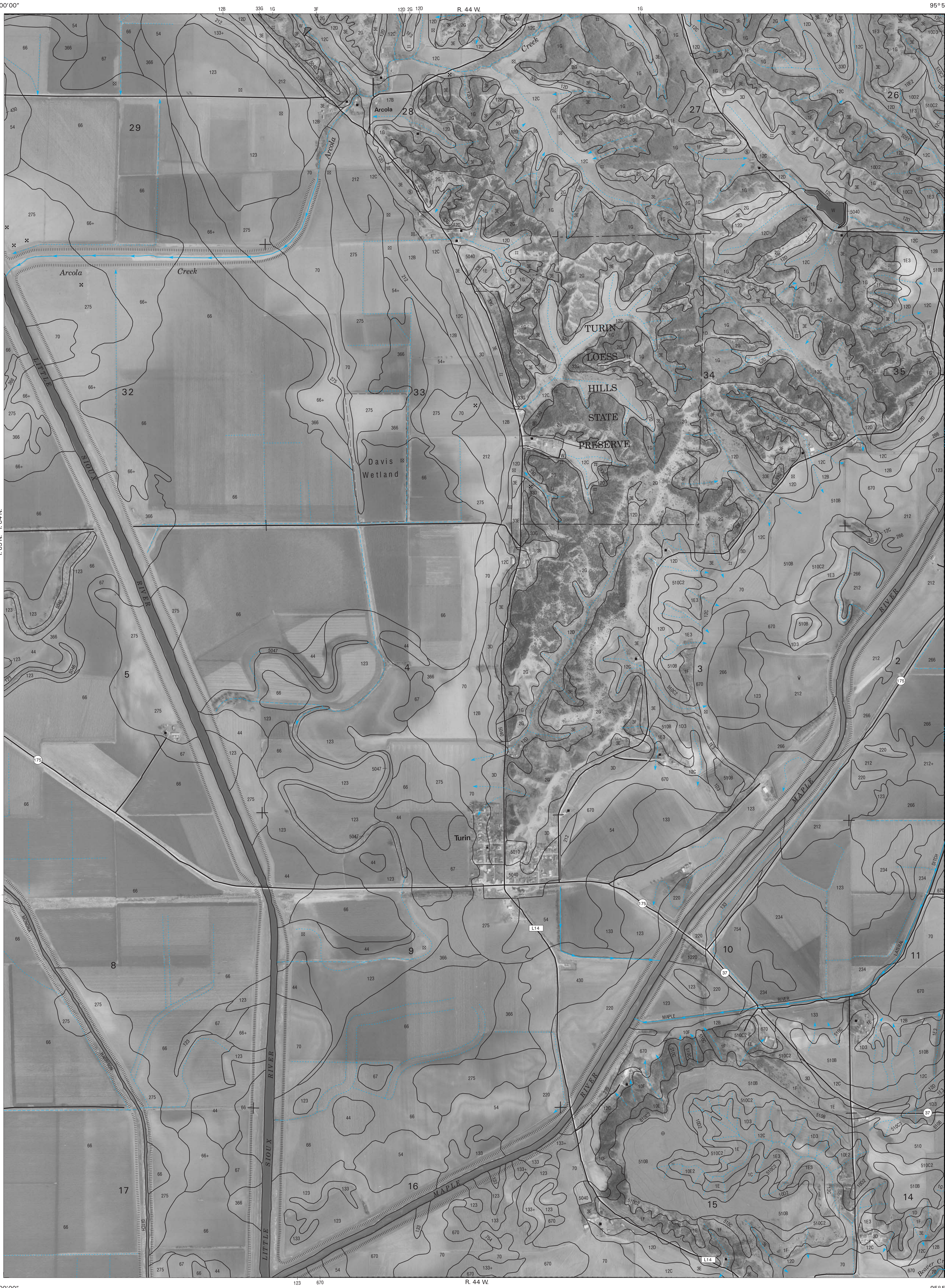
MONONA COUNTY, IOWA
CASTANA_SW QUADRANGLE
SHEET NUMBER 41 OF 74

(Joins sheet 30, Castana_NW)

96° 00′ 00″ 42° 03′ 45″ R. 44 W. 95° 56′ 15″ 42° 03′ 45″



T. 83 N. T. 84 N.

(Joins sheet 40, Onawa_SE)

(Joins sheet 42, Castana_SE)

42° 00′ 00″ 96° 00′ 00″ R. 44 W. 42° 00′ 00″ 95° 56′ 15″

(Joins sheet 51, Moorhead_NW_NW)

SCALE 1:12000

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH

QUARTER QUADRANGLE LOCATION

MILES: 0.5 0 0.5

FEET: 500 0 500 1000 1500 2000 2500 3000 3500

KILOMETERS: 0.5 0 0.5

1	2	3
4		5
6	7	8

1 ONAWA_NE
2 CASTANA_NW
3 CASTANA_NE
4 ONAWA_SE
5 CASTANA_SE
6 BLENCOE_NE
7 MOORHEAD_NW_NW
8 MOORHEAD_NW_NE

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CASTANA_SW, IOWA
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SHEET NUMBER 41 OF 74

UNITED STATES
DEPARTMENT OF AGRICULTURE
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MONONA COUNTY, IOWA
CASTANA_SE QUADRANGLE
SHEET NUMBER 42 OF 74

(Joins sheet 31, Castana_NE)

95° 56′15″ 42° 03′45″

95° 52′30″ 42° 03′45″

R. 44 W. R. 43 W.

(Joins sheet 41, Castana_SW)

(Joins sheet 43, Mapleton_SE_SW)

T. 83 N. T. 84 N.

42° 00′00″ 95° 56′15″

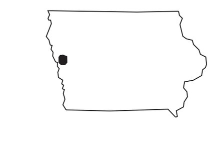
42° 00′00″ 95° 52′30″

R. 44 W. R. 43 W.

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH



QUARTER QUADRANGLE LOCATION

(Joins sheet 52, Moorhead_NW_NE)

SCALE 1:12000

MILES: 0.5 0 0.5

FEET: 500 0 500 1000 1500 2000 2500 3000 3500

KILOMETERS: 0.5 0 0.5

1	2	3
4		5
6	7	8

1 CASTANA_NW
2 CASTANA_NE
3 MAPLETON_SE_NW
4 CASTANA_SW
5 MAPLETON_SE_SW
6 MOORHEAD_NW_NW
7 MOORHEAD_NW_NE
8 MOORHEAD_NW

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UNITED STATES
DEPARTMENT OF AGRICULTURE
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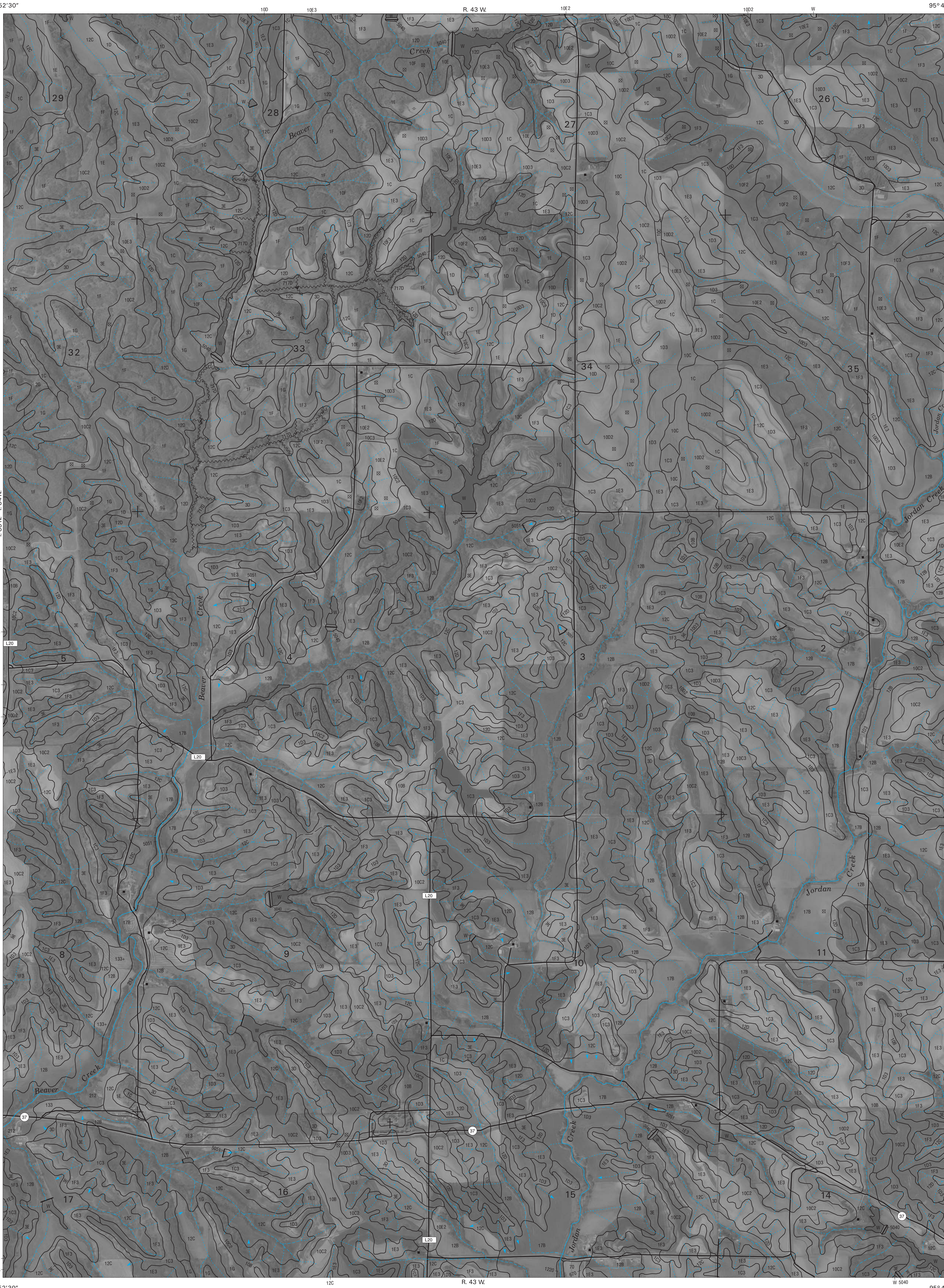
MONONA COUNTY, IOWA
MAPLETON_SE_SW QUADRANGLE
SHEET NUMBER 43 OF 74

(Joins sheet 32, Mapleton_SE_NW)

95° 52′30″ 42° 03′45″ — 95° 48′45″ 42° 03′45″



(Joins sheet 42, Castana_SE)

(Joins sheet 44, Mapleton_SE_SE)

42° 00′00″ 95° 52′30″ — 42° 00′00″ 95° 48′45″

(Joins sheet 53, Moorhead_NW)

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid
1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH

QUARTER QUADRANGLE LOCATION

SCALE 1:12000

0.5 0 0.5
MILES

500 0 500 1000 1500 2000 2500 3000 3500
FEET

0.5 0 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 CASTANA_NE
2 MAPLETON_SE_NW
3 MAPLETON_SE_NE
4 CASTANA_SE
5 MAPLETON_SE_SE
6 MOORHEAD_NW_NE
7 MOORHEAD_NW
8 MOORHEAD_NE

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UNITED STATES
DEPARTMENT OF AGRICULTURE
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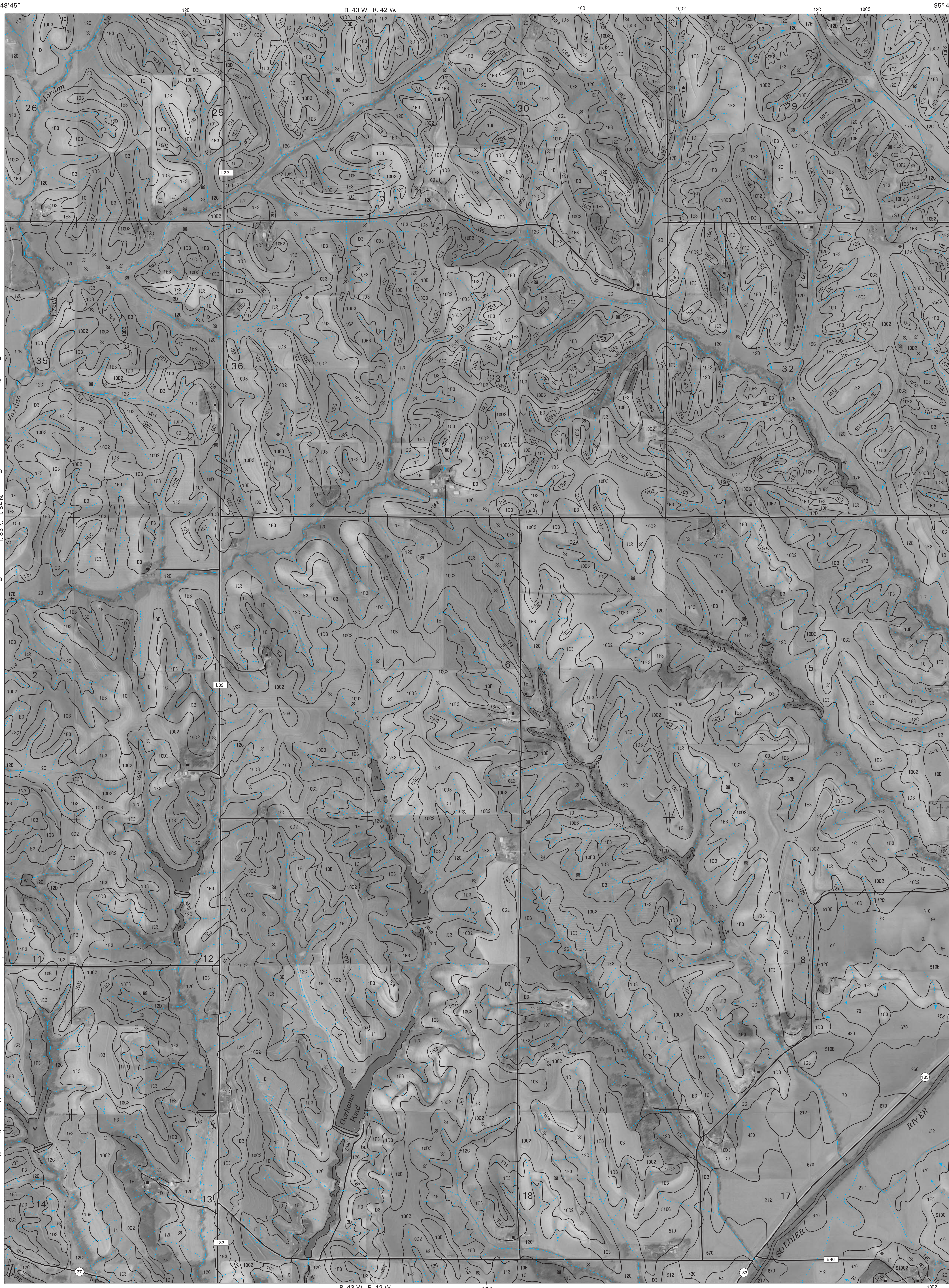
MONONA COUNTY, IOWA
MAPLETON_SE_SE QUADRANGLE
SHEET NUMBER 44 OF 74

(Joins sheet 33, Mapleton_SE_NE)

95° 48′45″ 42° 03′45″ R. 43 W. R. 42 W. 95° 45′00″ 42° 03′45″



(Joins sheet 43, Mapleton_SE_SW)

(Joins sheet 45, Ute_SW)

T. 84 N. T. 83 N.

42° 00′00″ 95° 48′45″ R. 43 W. R. 42 W. 42° 00′00″ 95° 45′00″

(Joins sheet 54, Moorhead_NE)

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid
1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH

QUARTER QUADRANGLE LOCATION

SCALE 1:12000

0.5 0 0.5
MILES

500 0 500 1000 1500 2000 2500 3000 3500
FEET

0.5 0 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 MAPLETON_SE_NW
2 MAPLETON_SE_NE
3 UTE_NW
4 MAPLETON_SE_SW
5 UTE_SW
6 MOORHEAD_NW
7 MOORHEAD_NE
8 DUNLAP_NW_NW

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MONONA COUNTY, IOWA
UTE_SW QUADRANGLE
SHEET NUMBER 45 OF 74

(Joins sheet 34, Ute_NW)

95° 45′00″ 42° 03′45″ — 95° 41′15″ 42° 03′45″

(Joins sheet 44, Mapleton_SE_SE)

(Joins sheet 46, Ute_SE)

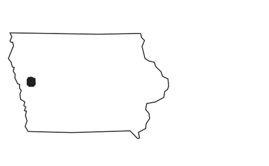
42° 00′00″ 95° 45′00″ — 42° 00′00″ 95° 41′15″

(Joins sheet 55, Dunlap_NW_NW)

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH



QUARTER QUADRANGLE LOCATION

SCALE 1:12000

MILES: 0.5 — 0 — 0.5

FEET: 500 0 500 1000 1500 2000 2500 3000 3500

KILOMETERS: 0.5 — 0 — 0.5

1	2	3
4		5
6	7	8

1 MAPLETON_SE_NE
2 UTE_NW
3 UTE_NE
4 MAPLETON_SE_SE
5 UTE_SE
6 MOORHEAD_NE
7 DUNLAP_NW_NW
8 DUNLAP_NW_NE

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DEPARTMENT OF AGRICULTURE
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MONONA COUNTY, IOWA
UTE_SE QUADRANGLE
SHEET NUMBER 46 OF 74

(Joins sheet 35, Ute_NE)

(Joins sheet 45, Ute_SW)

(Joins sheet 56, Dunlap_NW_NE)

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH

QUARTER QUADRANGLE LOCATION

SCALE 1:12000

0.5 0 0.5
MILES

500 0 500 1000 1500 2000 2500 3000 3500
FEET

0.5 0 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 UTE_NW
2 UTE_NE
3 CHARTER_OAK_NW
4 UTE_SW
5 CHARTER_OAK_SW
6 DUNLAP_NW_NW
7 DUNLAP_NW_NE
8 DUNLAP_NE_NW

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SHEET NUMBER 46 OF 74

UNITED STATES
DEPARTMENT OF AGRICULTURE
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MONONA COUNTY, IOWA
TEKAMAH_NW_NW QUADRANGLE
SHEET NUMBER 47 OF 74

(Joins sheet 37, Onawa_SW_SW)

96°15′00″ R. 46 W. 96°11′15″

42°00′00″ 42°00′00″

T. 83 N. T. 83 N.

(Joins sheet 48, Tekamah_NW_NE)

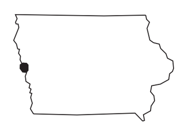
41°56′15″ R. 46 W. 41°56′15″

96°15′00″ 96°11′15″

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH



QUARTER QUADRANGLE LOCATION

SCALE 1:12000

0.5 0 0.5
MILES

500 0 500 1000 1500 2000 2500 3000 3500
FEET

0.5 0 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 MACY_SE
2 ONAWA_SW_SW
3 ONAWA_SW_SE
4 BERTHA_NE
5 TEKAMAH_NW_NE
6 BERTHA_SE
7 TEKAMAH_NW_SW
8 TEKAMAH_NW_SE

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3.75 MINUTE SERIES
SHEET NUMBER 47 OF 74

UNITED STATES
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MONONA COUNTY, IOWA
TEKAMAH_NW_NE QUADRANGLE
SHEET NUMBER 48 OF 74

(Joins sheet 38, Onawa_SW_SE)

96°11′15″ 42°00′00″ — 96°07′30″ 42°00′00″

(Joins sheet 47, Tekamah_NW_NW)

(Joins sheet 49, Blencoe_NW)

41°56′15″ 96°11′15″ — 41°56′15″ 96°07′30″

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH

QUARTER QUADRANGLE LOCATION

(Joins sheet 57, Tekamah_NW_SE)

SCALE 1:12000

MILES 0.5 0 0.5

FEET 500 0 500 1000 1500 2000 2500 3000 3500

KILOMETERS 0.5 0 0.5

INDEX TO ADJOINING 3.75 MAPS

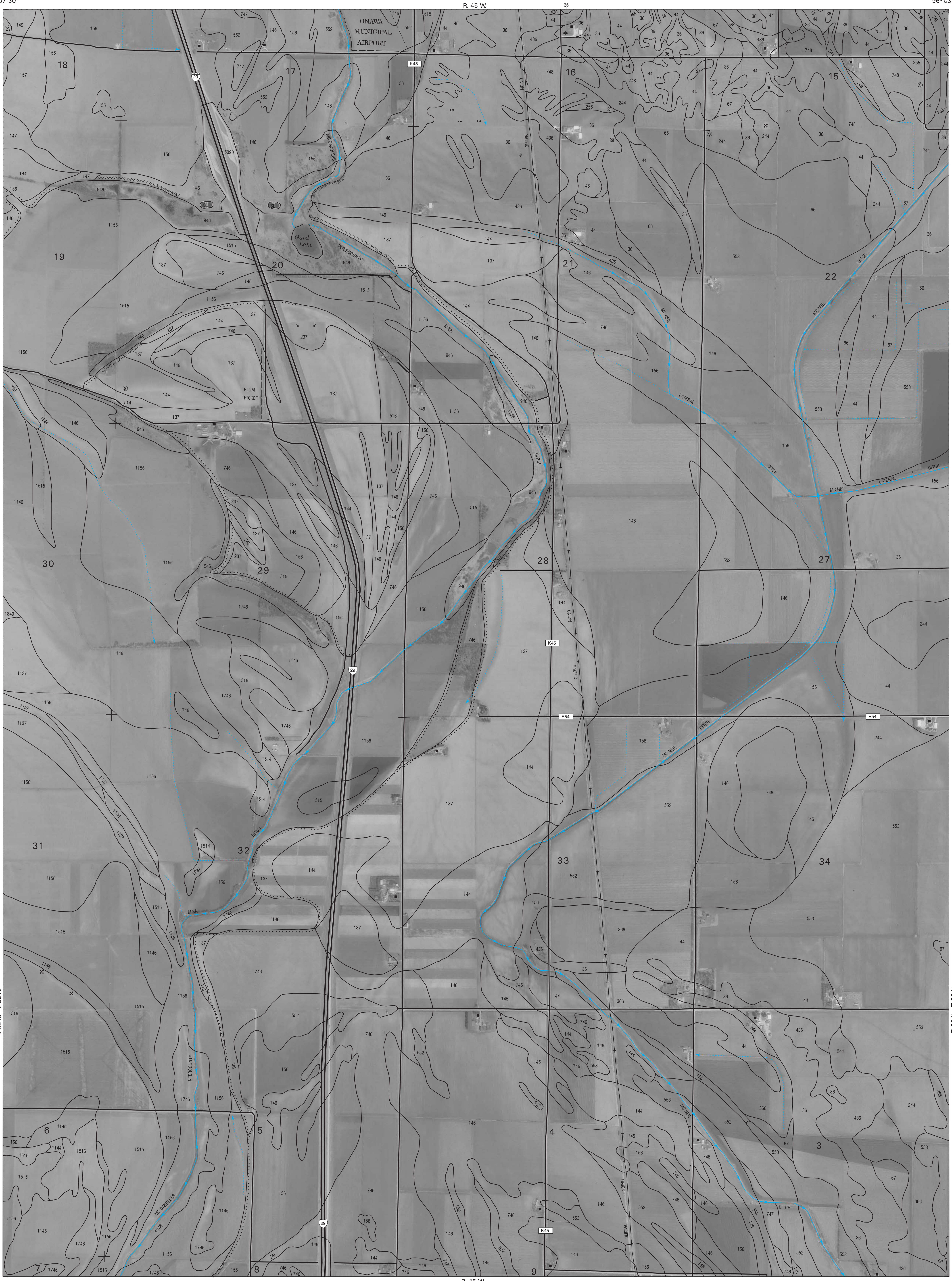
1 ONAWA_SW_SW
2 ONAWA_SW_SE
3 ONAWA_SW
4 TEKAMAH_NW_NW
5 BLENCOE_NW
6 TEKAMAH_NW_SW
7 TEKAMAH_NW_SE
8 BLENCOE_SW

TEKAMAH_NW_NE, IOWA
3.75 MINUTE SERIES
SHEET NUMBER 48 OF 74

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

(Joins sheet 39, Onawa_SW)

96° 07′30″ 42° 00′00″ R. 45 W. 96° 03′45″ 42° 00′00″



(Joins sheet 48, Tekamah_NW_NE)

(Joins sheet 50, Blencoe_NE)

41° 56′15″ 96° 07′30″ R. 45 W. 41° 56′15″ 96° 03′45″

(Joins sheet 58, Blencoe_SW)

SCALE 1:12000

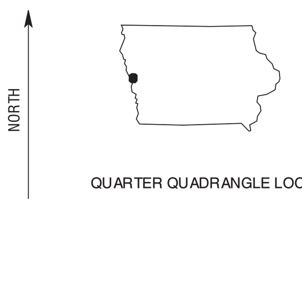
0.5 0 0.5 MILES

500 0 500 1000 1500 2000 2500 3000 3500 FEET

0.5 0 0.5 KILOMETERS

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.



QUARTER QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

1 ONAWA_SW_SE
2 ONAWA_SW
3 ONAWA_SE
4 TEKAMAH_NW_NE
5 BLENCOE_NE
6 TEKAMAH_NW_SE
7 BLENCOE_SW
8 BLENCOE_SE

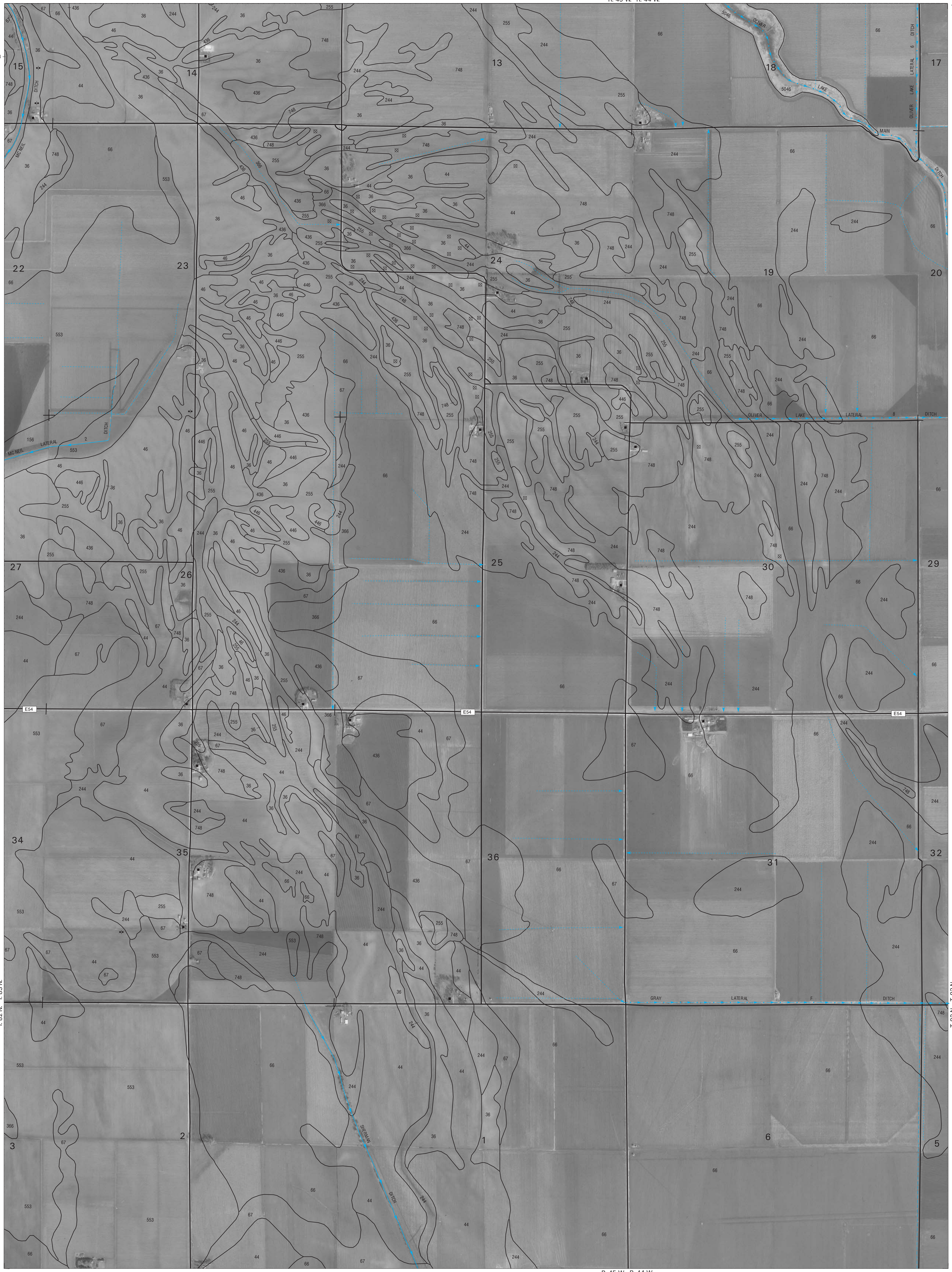
INDEX TO ADJOINING 3.75 MAPS

BLENCOE_NW, IOWA
3.75 MINUTE SERIES
SHEET NUMBER 49 OF 74

(Joins sheet 40, Onawa_SE)

96° 03′45″ 42° 00′00″ R. 45 W. R. 44 W. 96° 00′00″ 42° 00′00″

(Joins sheet 49, Blencoe_NW)



(Joins sheet 51, Moorhead_NW_NW)

41° 56′15″ 96° 03′45″ R. 45 W. R. 44 W. 41° 56′15″ 96° 00′00″

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

QUARTER QUADRANGLE LOCATION

(Joins sheet 59, Blencoe_SE)

SCALE 1:12000

0.5 0 0.5
MILES

500 0 500 1000 1500 2000 2500 3000 3500
FEET

0.5 0 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 ONAWA_SW
2 ONAWA_SE
3 CASTANA_SW
4 BLENCOE_NW
5 MOORHEAD_NW_NW
6 BLENCOE_SW
7 BLENCOE_SE
8 MOORHEAD_NW_SW

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BLENCOE_NE, IOWA
3.75 MINUTE SERIES
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NATURAL RESOURCES CONSERVATION SERVICE

MONONA COUNTY, IOWA
MOORHEAD_NW_NW QUADRANGLE
SHEET NUMBER 51 OF 74

(Joins sheet 41, Castana_SW)

96° 00′00″ 42° 00′00″ — 95° 56′15″ 42° 00′00″

(Joins sheet 50, Blencoe_NE)

(Joins sheet 52, Moorhead_NW_NE)

41° 56′15″ 96° 00′00″ — 41° 56′15″ 95° 56′15″

(Joins sheet 60, Moorhead_NW_SW)

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH

QUARTER QUADRANGLE LOCATION

SCALE 1:12000

0.5 — 0 — 0.5 MILES

500 0 500 1000 1500 2000 2500 3000 3500 FEET

0.5 — 0 — 0.5 KILOMETERS

1	2	3
4		5
6	7	8

1 ONAWA_SE
2 CASTANA_SW
3 CASTANA_SE
4 BLENCOE_NE
5 MOORHEAD_NW_NE
6 BLENCOE_SE
7 MOORHEAD_NW_SW
8 MOORHEAD_NW_SE

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SHEET NUMBER 51 OF 74

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MONONA COUNTY, IOWA
MOORHEAD_NW_NE QUADRANGLE
SHEET NUMBER 52 OF 74

(Joins sheet 42, Castana_SE)

95° 56'15" 42° 00'00" R. 44 W. R. 43 W. 95° 52'30" 42° 00'00"

(Joins sheet 51, Moorhead_NW)

(Joins sheet 53, Moorhead_NW)

T. 82 N. T. 83 N.

41° 56'15" 95° 56'15" R. 44 W. R. 43 W. 41° 56'15" 95° 52'30"

(Joins sheet 61, Moorhead_NW_SE)

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH

QUARTER QUADRANGLE LOCATION

SCALE 1:12000

MILES: 0.5 0 0.5

FEET: 500 0 500 1000 1500 2000 2500 3000 3500

KILOMETERS: 0.5 0 0.5

1	2	3
4		5
6	7	8

1 CASTANA_SW
2 CASTANA_SE
3 MAPLETON_SE_SW
4 MOORHEAD_NW_NW
5 MOORHEAD_NW
6 MOORHEAD_NW_SW
7 MOORHEAD_NW_SE
8 MOORHEAD_SW

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3.75 MINUTE SERIES
SHEET NUMBER 52 OF 74

UNITED STATES
DEPARTMENT OF AGRICULTURE
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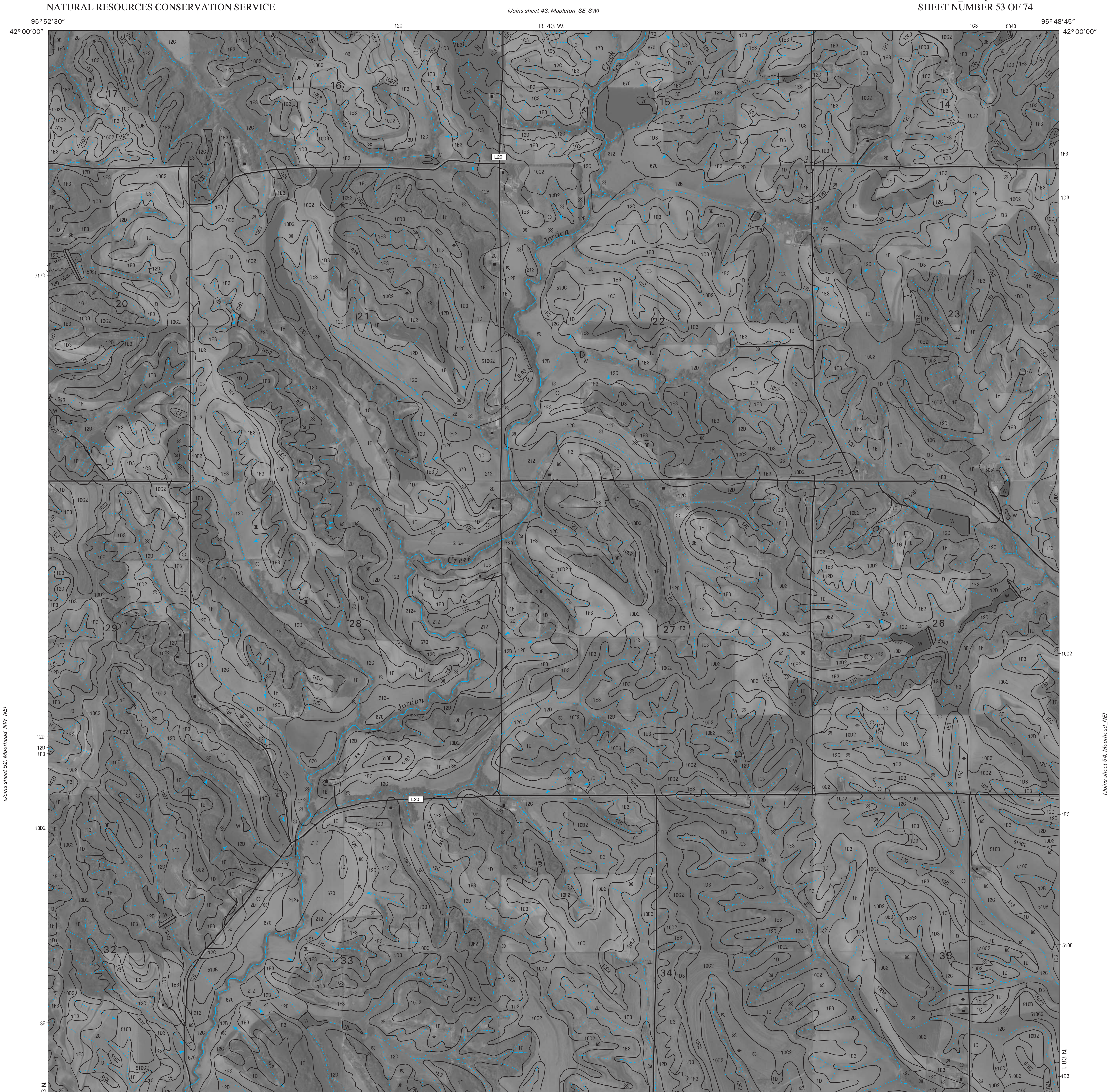
MONONA COUNTY, IOWA
MOORHEAD_NW QUADRANGLE
SHEET NUMBER 53 OF 74



This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH

QUARTER QUADRANGLE LOCATION

SCALE 1:12000

MILES: 0.5 0 0.5

FEET: 500 0 500 1000 1500 2000 2500 3000 3500

KILOMETERS: 0.5 0 0.5

1	2	3
4		5
6	7	8

1 CASTANA_SE
2 MAPLETON_SE_SW
3 MAPLETON_SE_SE
4 MOORHEAD_NW_NE
5 MOORHEAD_NE
6 MOORHEAD_NW_SE
7 MOORHEAD_SW
8 MOORHEAD_SE

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MONONA COUNTY, IOWA
MOORHEAD_NE QUADRANGLE
SHEET NUMBER 54 OF 74

(Joins sheet 44, Mapleton_SE_SE)

(Joins sheet 63, Moorhead_SE)

SCALE 1:12000

MILES · FEET · KILOMETERS

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH

QUARTER QUADRANGLE LOCATION

1 MAPLETON_SE_SW
2 MAPLETON_SE_SE
3 UTE_SW
4 MOORHEAD_NW
5 DUNLAP_NW_NW
6 MOORHEAD_SW
7 MOORHEAD_SE
8 DUNLAP_NW_SW

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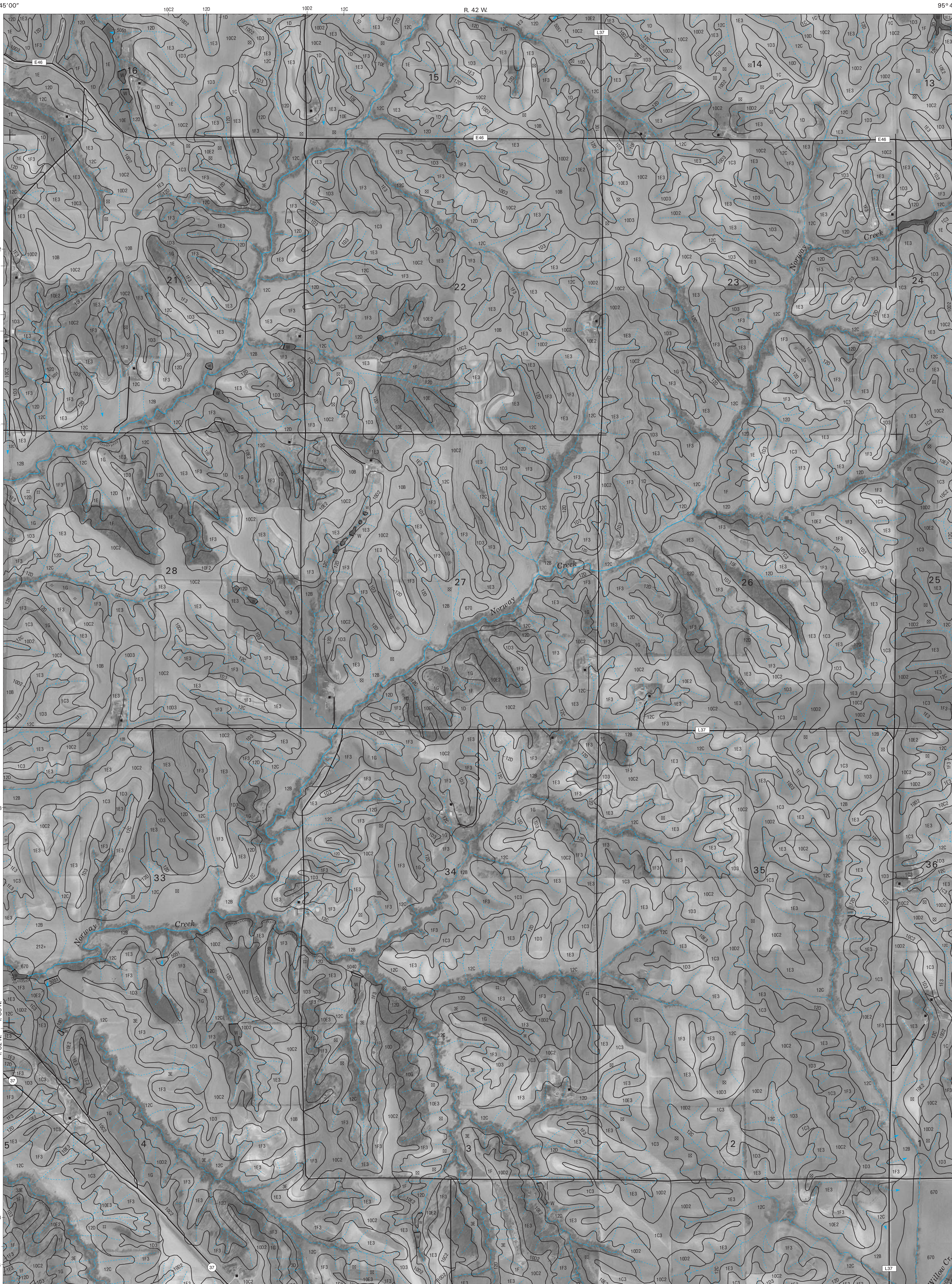
MONONA COUNTY, IOWA
DUNLAP_NW_NW QUADRANGLE
SHEET NUMBER 55 OF 74

(Joins sheet 45, Ute_SW)

95° 45′00″ 42° 00′00″ — 95° 41′15″ 42° 00′00″



(Joins sheet 54, Moorhead_NE)

(Joins sheet 56, Dunlap_NW_NE)

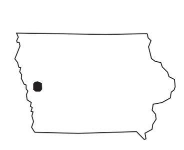
41° 56′15″ 95° 45′00″ — 41° 56′15″ 95° 41′15″

(Joins sheet 64, Dunlap_NW_SW)

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH



QUARTER QUADRANGLE LOCATION

SCALE 1:12000

0.5 — 0 — 0.5
MILES

500 — 0 — 500 — 1000 — 1500 — 2000 — 2500 — 3000 — 3500
FEET

0.5 — 0 — 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 MAPLETON_SE_SE
2 UTE_SW
3 UTE_SE
4 MOORHEAD_NE
5 DUNLAP_NW_NE
6 MOORHEAD_SE
7 DUNLAP_NW_SW
8 DUNLAP_NW_SE

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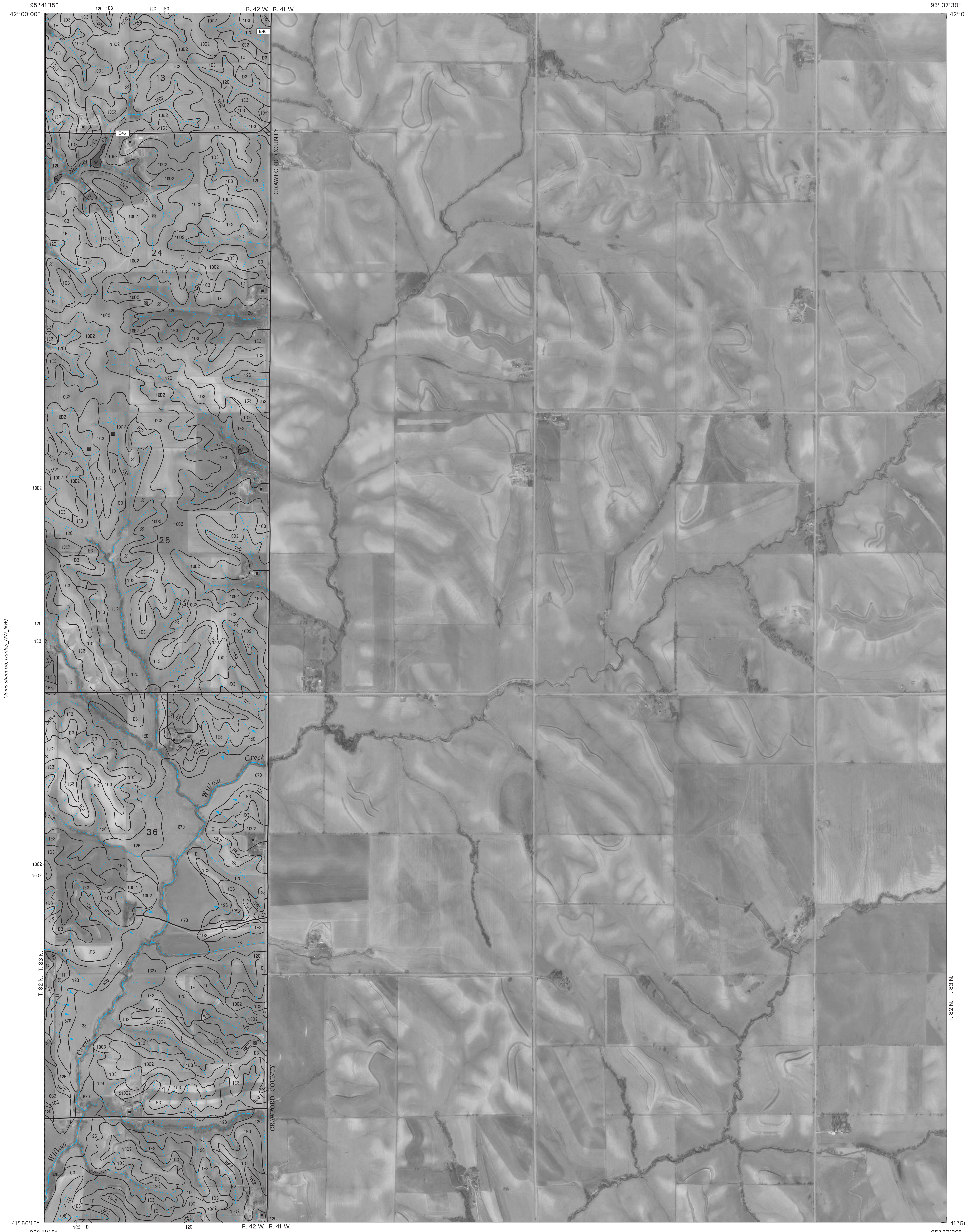
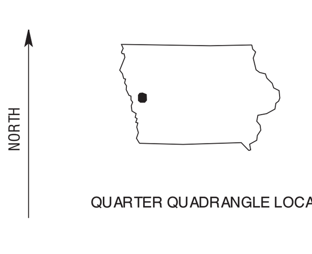
MONONA COUNTY, IOWA
DUNLAP_NW_NE QUADRANGLE
SHEET NUMBER 56 OF 74



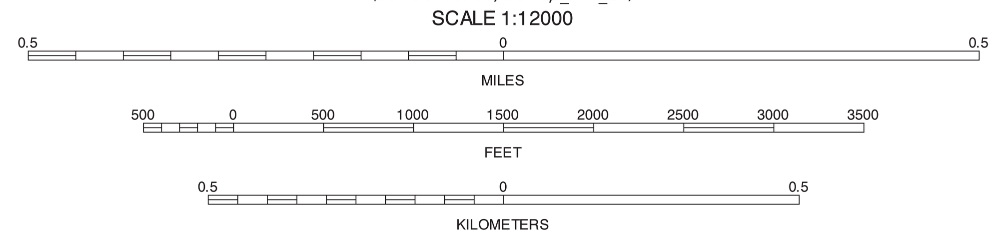
This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.



QUARTER QUADRANGLE LOCATION

SCALE 1:12000



1	2	3
4		5
6	7	8

1 UTE_SW
2 UTE_SE
3 CHARTER_OAK_SW
4 DUNLAP_NW_NW
5 DUNLAP_NE_NW
6 DUNLAP_NW_SW
7 DUNLAP_NW_SE
8 DUNLAP_NE_SW

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MONONA COUNTY, IOWA
TEKAMAH_NW_SE QUADRANGLE
SHEET NUMBER 57 OF 74

(Joins sheet 48, Tekamah_NW_NE)

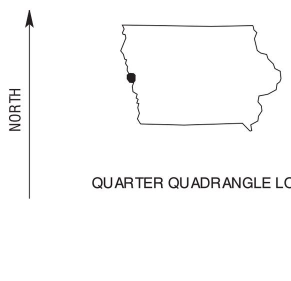
96°11′15″ 41°56′15″ — 96°07′30″ 41°56′15″

(Joins sheet 58, Blencoe_SW)

41°52′30″ 96°11′15″ — R. 46 W. R. 45 W. — 41°52′30″ 96°07′30″

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

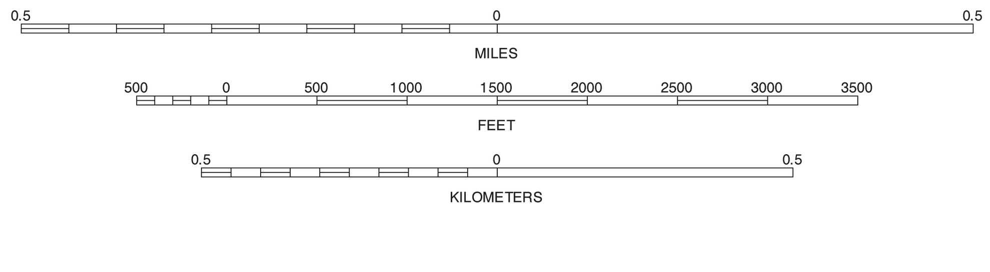
North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.



QUARTER QUADRANGLE LOCATION

(Joins sheet 66, Tekamah_NE)

SCALE 1:12000



1	2	3
4		5
6	7	8

1 TEKAMAH_NW_NW
2 TEKAMAH_NW_NE
3 BLENCOE_NW
4 TEKAMAH_NW_SW
5 BLENCOE_SW
6 TEKAMAH_NW
7 TEKAMAH_NE
8 LITTLE_SIOUX_NW

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NATURAL RESOURCES CONSERVATION SERVICE

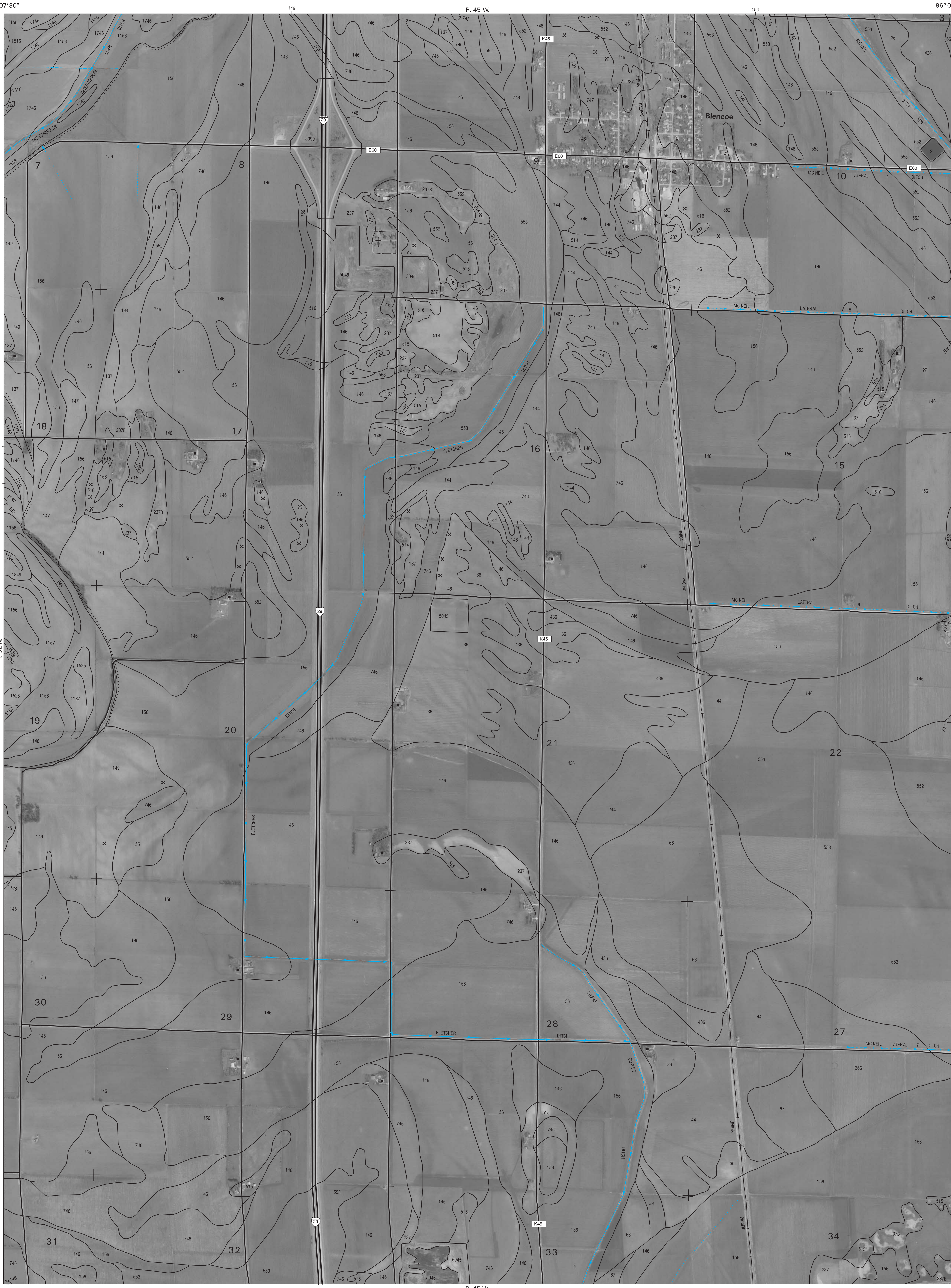
MONONA COUNTY, IOWA
BLENCOE_SW QUADRANGLE
SHEET NUMBER 58 OF 74

(Joins sheet 49, Blencoe_NW)

96° 07′30″ 41° 56′15″

96° 03′45″ 41° 56′15″

(Joins sheet 57, Tekamah_NW_SE)



(Joins sheet 59, Blencoe_SE)

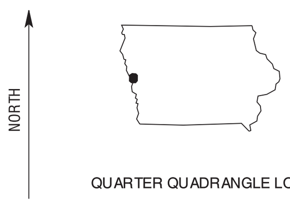
41° 52′30″ 96° 07′30″

41° 52′30″ 96° 03′45″

(Joins sheet 67, Little_Sioux_NW)

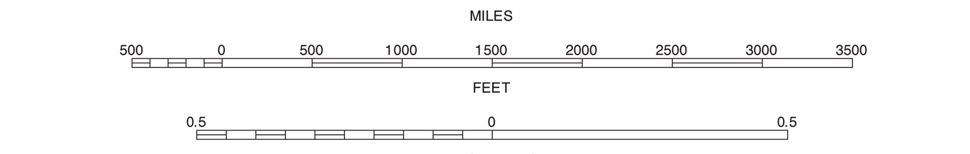
This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

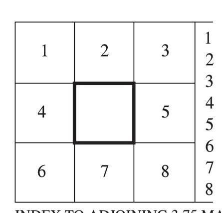
North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.



QUARTER QUADRANGLE LOCATION

SCALE 1:12000





1 TEKAMAH_NW_NE
2 BLENCOE_NW
3 BLENCOE_NE
4 TEKAMAH_NW_SE
5 BLENCOE_SE
6 TEKAMAH_NE
7 LITTLE_SIOUX_NW
8 LITTLE_SIOUX_NE

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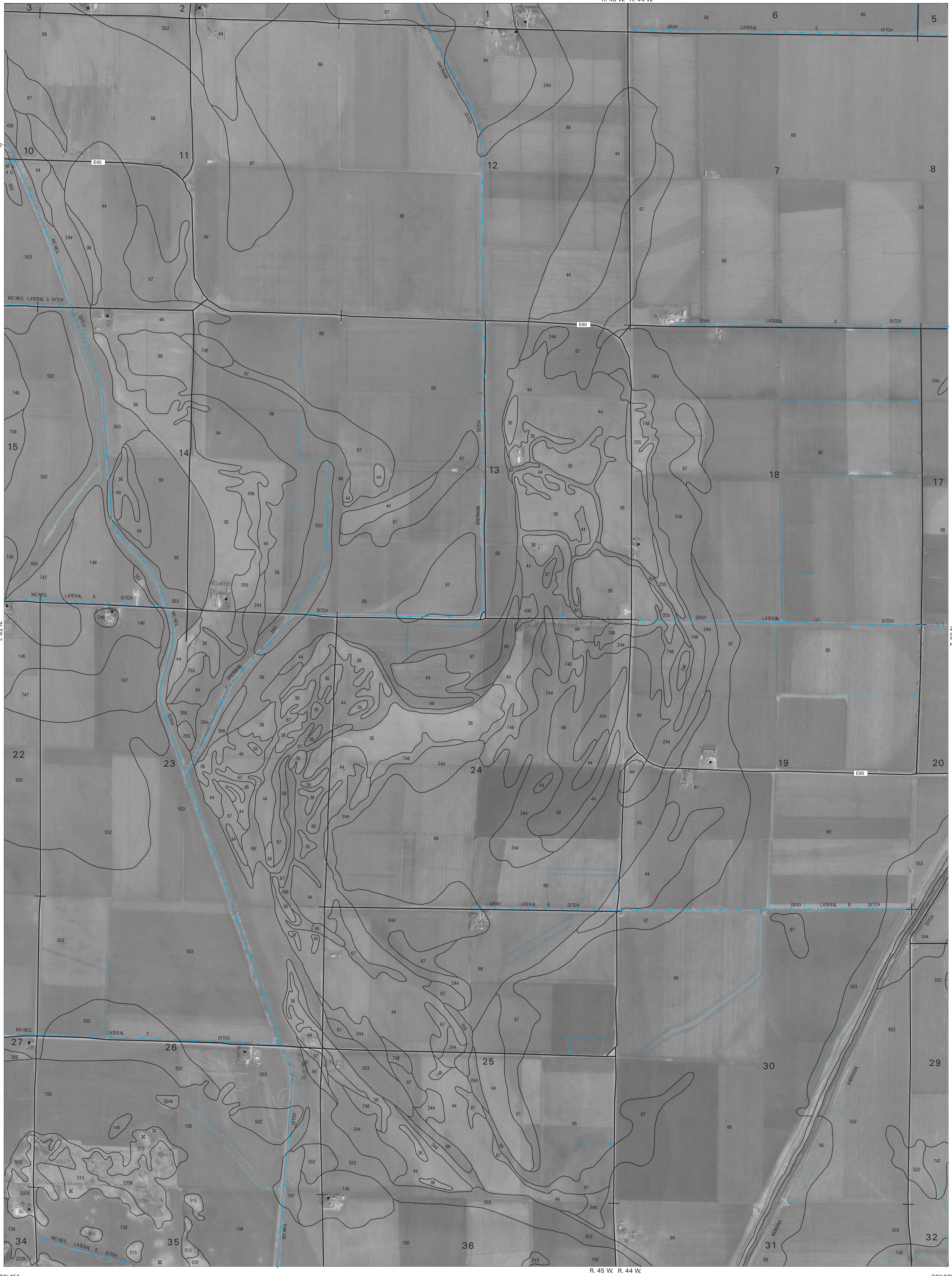
MONONA COUNTY, IOWA
BLENCOE_SE QUADRANGLE
SHEET NUMBER 59 OF 74

(Joins sheet 50, Blencoe_NE)

96° 03′ 45″ 41° 56′ 15″ R. 45 W. R. 44 W. 96° 00′ 00″ 41° 56′ 15″

(Joins sheet 58, Blencoe_SW) T. 82 N.



T. 82 N. *(Joins sheet 60, Moorhead_NW_SW)*

41° 52′ 30″ 96° 03′ 45″ R. 45 W. R. 44 W. 41° 52′ 30″ 96° 00′ 00″

(Joins sheet 68, Little_Sioux_NE)

SCALE 1:12000

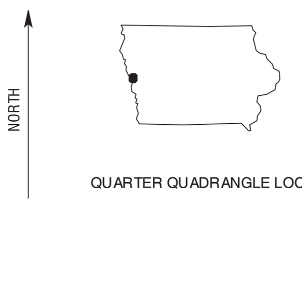
0.5 0 0.5 MILES

500 0 500 1000 1500 2000 2500 3000 3500 FEET

0.5 0 0.5 KILOMETERS

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.



QUARTER QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

1 BLENCOE_NW
2 BLENCOE_NE
3 MOORHEAD_NW_NW
4 BLENCOE_SW
5 MOORHEAD_NW_SW
6 LITTLE_SIOUX_NW
7 LITTLE_SIOUX_NE
8 PISGAH_NW

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MONONA COUNTY, IOWA
MOORHEAD_NW_SW QUADRANGLE
SHEET NUMBER 60 OF 74

(Joins sheet 51, Moorhead_NW_NW)

96° 00'00" 41° 56'15" R. 44 W. 95° 56'15" 41° 56'15"

(Joins sheet 59, Blencoe_SE) T. 82 N.

T. 82 N. (Joins sheet 61, Moorhead_NW_SE)

41° 52'30" 96° 00'00" R. 44 W. 95° 56'15" 41° 52'30"

(Joins sheet 69, Pisgah_NW)

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH

QUARTER QUADRANGLE LOCATION

SCALE 1:12000

MILES 0.5 0 0.5

FEET 500 0 500 1000 1500 2000 2500 3000 3500

KILOMETERS 0.5 0 0.5

1	2	3
4		5
6	7	8

1 BLENCOE_NE
2 MOORHEAD_NW_NW
3 MOORHEAD_NW_NE
4 BLENCOE_SE
5 MOORHEAD_NW_SE
6 LITTLE_SIOUX_NE
7 PISGAH_NW
8 PISGAH_NE

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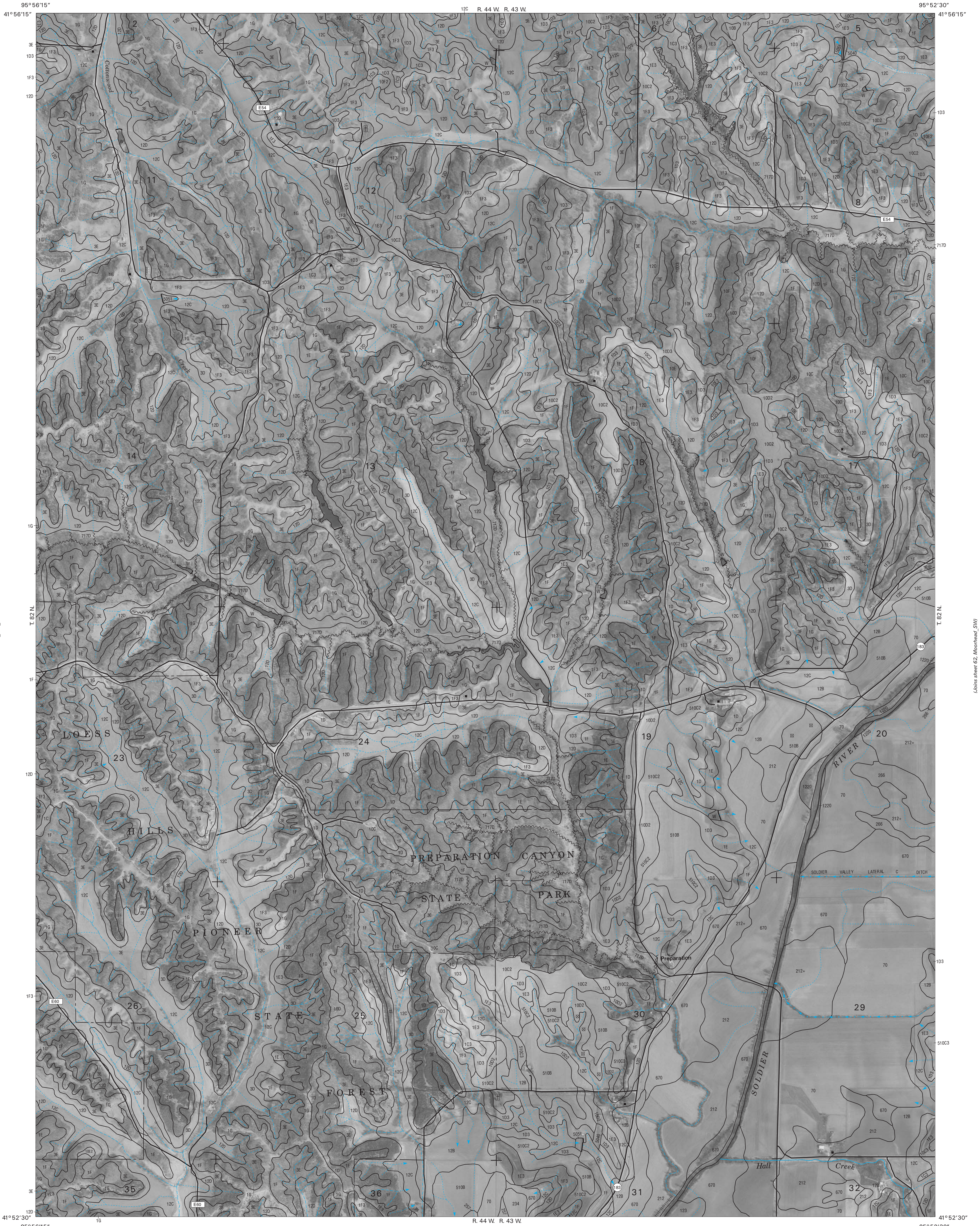
MONONA COUNTY, IOWA
MOORHEAD_NW_SE QUADRANGLE
SHEET NUMBER 61 OF 74

(Joins sheet 52, Moorhead_NW_NE)



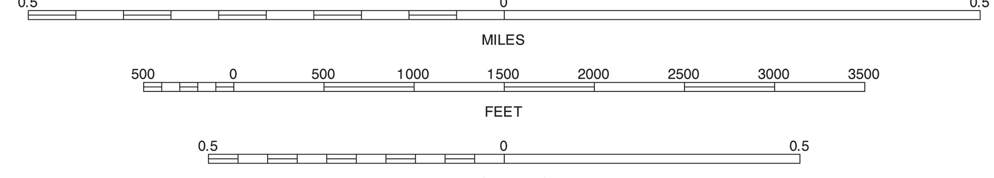
(Joins sheet 70, Pisgah_NE)

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

QUARTER QUADRANGLE LOCATION

SCALE 1:12000



1	2	3
4		5
6	7	8

1 MOORHEAD_NW_NW
2 MOORHEAD_NW_NE
3 MOORHEAD_NW
4 MOORHEAD_NW_SW
5 MOORHEAD_SW
6 PISGAH_NW
7 PISGAH_NE
8 MOORHEAD_SE_NW

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MONONA COUNTY, IOWA
MOORHEAD_SW QUADRANGLE
SHEET NUMBER 62 OF 74

(Joins sheet 53, Moorhead_NW)

(Joins sheet 71, Moorhead_SE_NW)

SCALE 1:12000

MILES: 0.5 0 0.5
FEET: 500 0 500 1000 1500 2000 2500 3000 3500
KILOMETERS: 0.5 0 0.5

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

1 MOORHEAD_NW_NE
2 MOORHEAD_NW
3 MOORHEAD_NE
4 MOORHEAD_NW_SE
5 MOORHEAD_SE
6 PISGAH_NE
7 MOORHEAD_SE_NW
8 MOORHEAD_SE_NE

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UNITED STATES
DEPARTMENT OF AGRICULTURE
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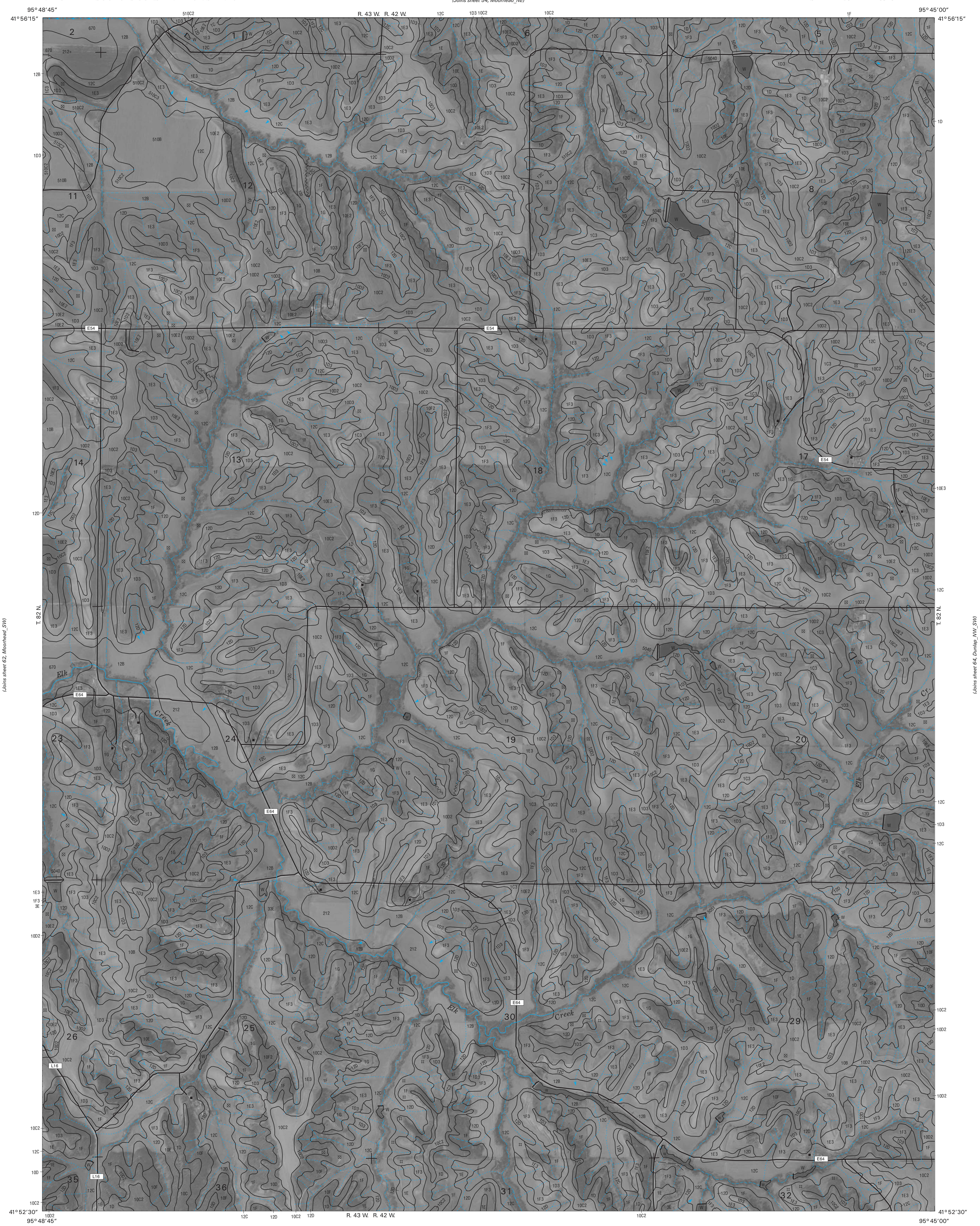
MONONA COUNTY, IOWA
MOORHEAD_SE QUADRANGLE
SHEET NUMBER 63 OF 74



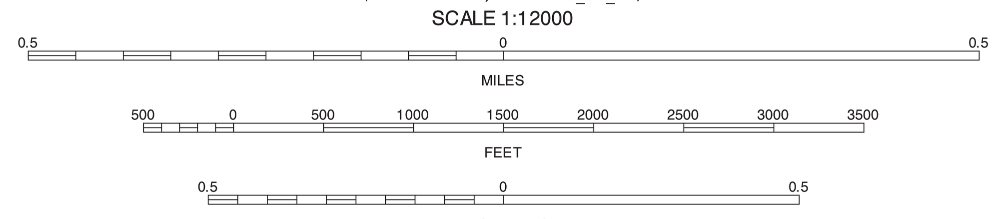
(Joins sheet 72, Moorhead_SE_NE)

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

QUARTER QUADRANGLE LOCATION

SCALE 1:12000



1	2	3
4		5
6	7	8

1 MOORHEAD_NW
2 MOORHEAD_NE
3 DUNLAP_NW_NW
4 MOORHEAD_SW
5 DUNLAP_NW_SW
6 MOORHEAD_SE_NW
7 MOORHEAD_SE_NE
8 DUNLAP_SW_NW

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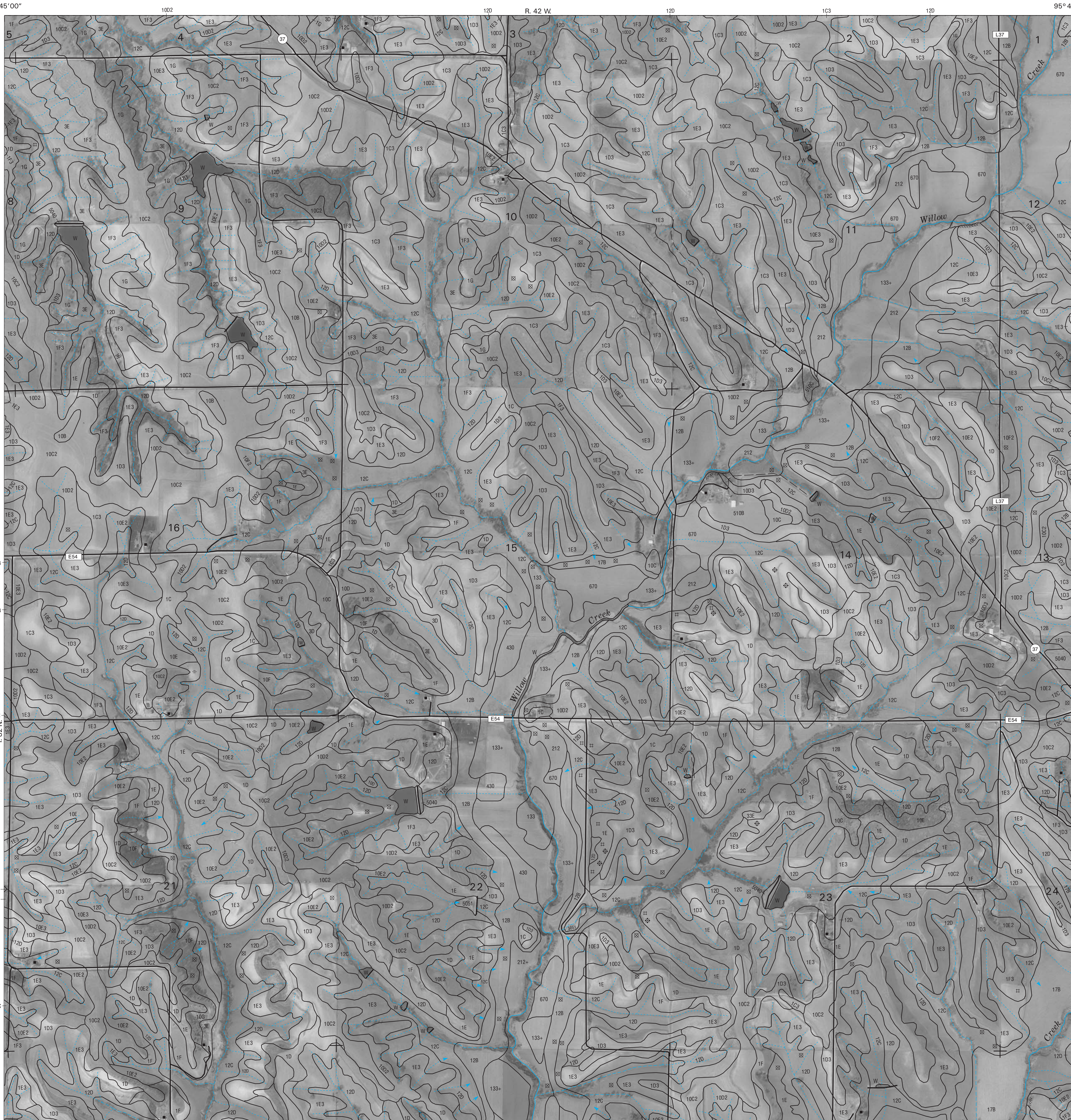
MONONA COUNTY, IOWA
DUNLAP_NW_SW QUADRANGLE
SHEET NUMBER 64 OF 74

(Joins sheet 55, Dunlap_NW_NW)



(Joins sheet 73, Dunlap_SW_NW)

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH

QUARTER QUADRANGLE LOCATION

SCALE 1:12000

0.5 0 0.5
MILES

500 0 500 1000 1500 2000 2500 3000 3500
FEET

0.5 0 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 MOORHEAD_NE
2 DUNLAP_NW_NW
3 DUNLAP_NW_NE
4 MOORHEAD_SE
5 DUNLAP_NW_SE
6 MOORHEAD_SE_NE
7 DUNLAP_SW_NW
8 DUNLAP_SW_NE

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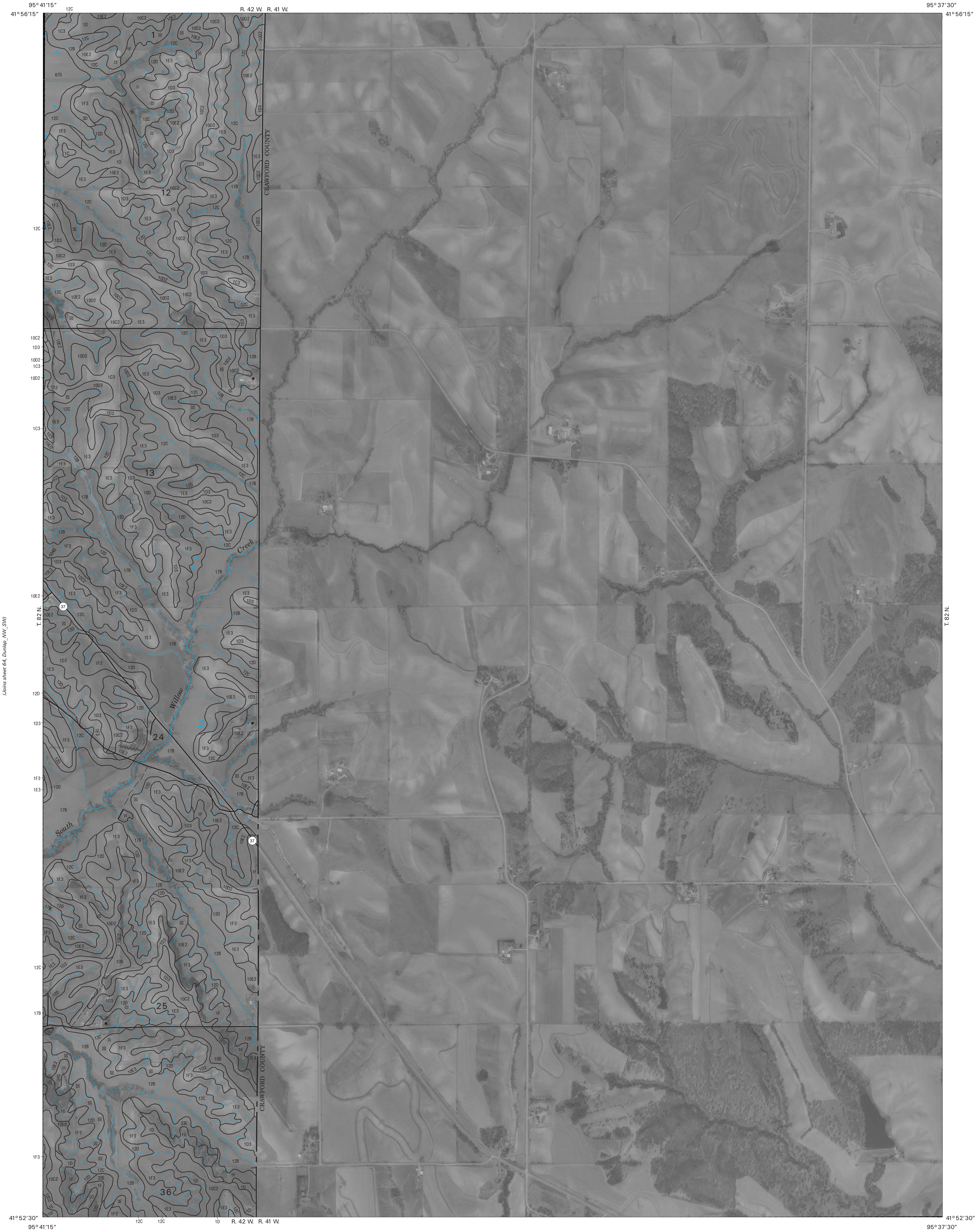
MONONA COUNTY, IOWA
DUNLAP_NW_SE QUADRANGLE
SHEET NUMBER 65 OF 74

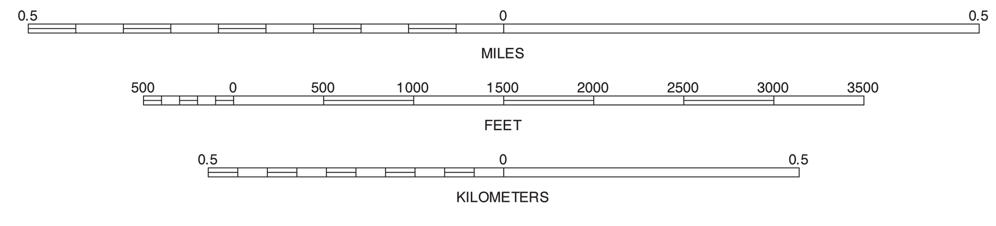
(Joins sheet 56, Dunlap_NW_NE)



(Joins sheet 64, Dunlap_NW_SW)

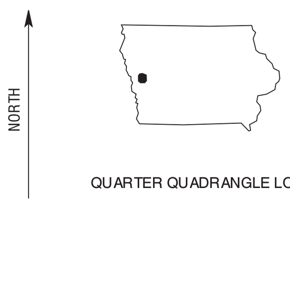
(Joins sheet 74, Dunlap_SW_NE)

SCALE 1:12000

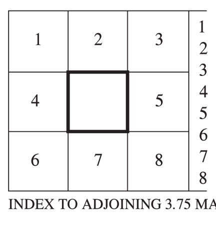


This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.



QUARTER QUADRANGLE LOCATION



1 DUNLAP_NW_NW
2 DUNLAP_NW_NE
3 DUNLAP_NE_NW
4 DUNLAP_NW_SW
5 DUNLAP_NE_SW
6 DUNLAP_SW_NW
7 DUNLAP_SW_NE
8 DUNLAP_NW

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MONONA COUNTY, IOWA
TEKAMAH_NE QUADRANGLE
SHEET NUMBER 66 OF 74

(Joins sheet 57, Tekamah_NW_SE)

96°11′15″ 41°52′30″

R. 46 W. R. 45 W.

96°07′30″ 41°52′30″

T. 81 N. T. 82 N.

T. 81 N. T. 82 N.

(Joins sheet 67, Little_Sioux_NW)

41°48′45″ 96°11′15″

R. 46 W. R. 45 W.

41°48′45″ 96°07′30″

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid
1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH

QUARTER QUADRANGLE LOCATION

SCALE 1:12000

0.5 0 0.5
MILES

500 0 500 1000 1500 2000 2500 3000 3500
FEET

0.5 0 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 TEKAMAH_NW_SW
2 TEKAMAH_NW_SE
3 BLENCOE_SW
4 TEKAMAH_NW
5 LITTLE_SIOUX_NW
6 TEKAMAH_SW
7 TEKAMAH_SE
8 LITTLE_SIOUX_SW

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MONONA COUNTY, IOWA
LITTLE_SIOUX_NW QUADRANGLE
SHEET NUMBER 67 OF 74

(Joins sheet 58, Blencoe_SW)

96° 07′ 30″ R. 45 W. 96° 03′ 45″

41° 52′ 30″ 41° 52′ 30″

T. 81 N. T. 82 N. T. 81 N. T. 82 N.

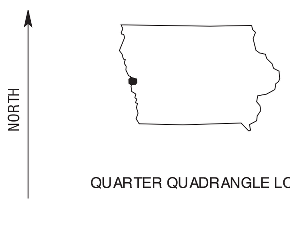
(Joins sheet 66, Tekamah_NE) *(Joins sheet 68, Little_Sioux_NE)*

41° 48′ 45″ R. 45 W. 41° 48′ 45″

96° 07′ 30″ 96° 03′ 45″

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.



QUARTER QUADRANGLE LOCATION

SCALE 1:12000

0.5 0 0.5
MILES

500 0 500 1000 1500 2000 2500 3000 3500
FEET

0.5 0 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 TEKAMAH_NW_SE
2 BLENCOE_SW
3 BLENCOE_SE
4 TEKAMAH_NE
5 LITTLE_SIOUX_NE
6 TEKAMAH_SE
7 LITTLE_SIOUX_SW
8 LITTLE_SIOUX_SE

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MONONA COUNTY, IOWA
LITTLE_SIOUX_NE QUADRANGLE
SHEET NUMBER 68 OF 74

(Joins sheet 59, Blencoe_SE)

96° 03′45″ 41° 52′30″ R. 45 W. R. 44 W. 96° 00′00″ 41° 52′30″

T. 82 N. T. 81 N.

(Joins sheet 67, Little_Sioux_NW)

(Joins sheet 69, Pisgah_NW)

41° 48′45″ 96° 03′45″ R. 45 W. R. 44 W. 41° 48′45″ 96° 00′00″

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH

QUARTER QUADRANGLE LOCATION

SCALE 1:12000

0.5 0 0.5
MILES

500 0 500 1000 1500 2000 2500 3000 3500
FEET

0.5 0 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 BLENCOE_SW
2 BLENCOE_SE
3 MOORHEAD_NW_SW
4 LITTLE_SIOUX_NW
5 PISGAH_NW
6 LITTLE_SIOUX_SW
7 LITTLE_SIOUX_SE
8 PISGAH_SW

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MONONA COUNTY, IOWA
PISGAH_NW QUADRANGLE
SHEET NUMBER 69 OF 74

(Joins sheet 60, Moorhead_NW_SW)

96° 00′00″ 41° 52′30″ R. 44 W. 95° 56′15″ 41° 52′30″

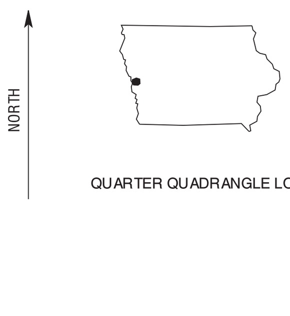
(Joins sheet 68, Little_Sioux_NE)

(Joins sheet 70, Pisgah_NE)

41° 48′45″ 96° 00′00″ R. 44 W. 41° 48′45″ 95° 56′15″

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.



QUARTER QUADRANGLE LOCATION

SCALE 1:12000

0.5 0 0.5
MILES

500 0 500 1000 1500 2000 2500 3000 3500
FEET

0.5 0 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 BLENCOE_SE
2 MOORHEAD_NW_SW
3 MOORHEAD_NW_SE
4 LITTLE_SIOUX_NE
5 PISGAH_NE
6 LITTLE_SIOUX_SE
7 PISGAH_SW
8 PISGAH_SE

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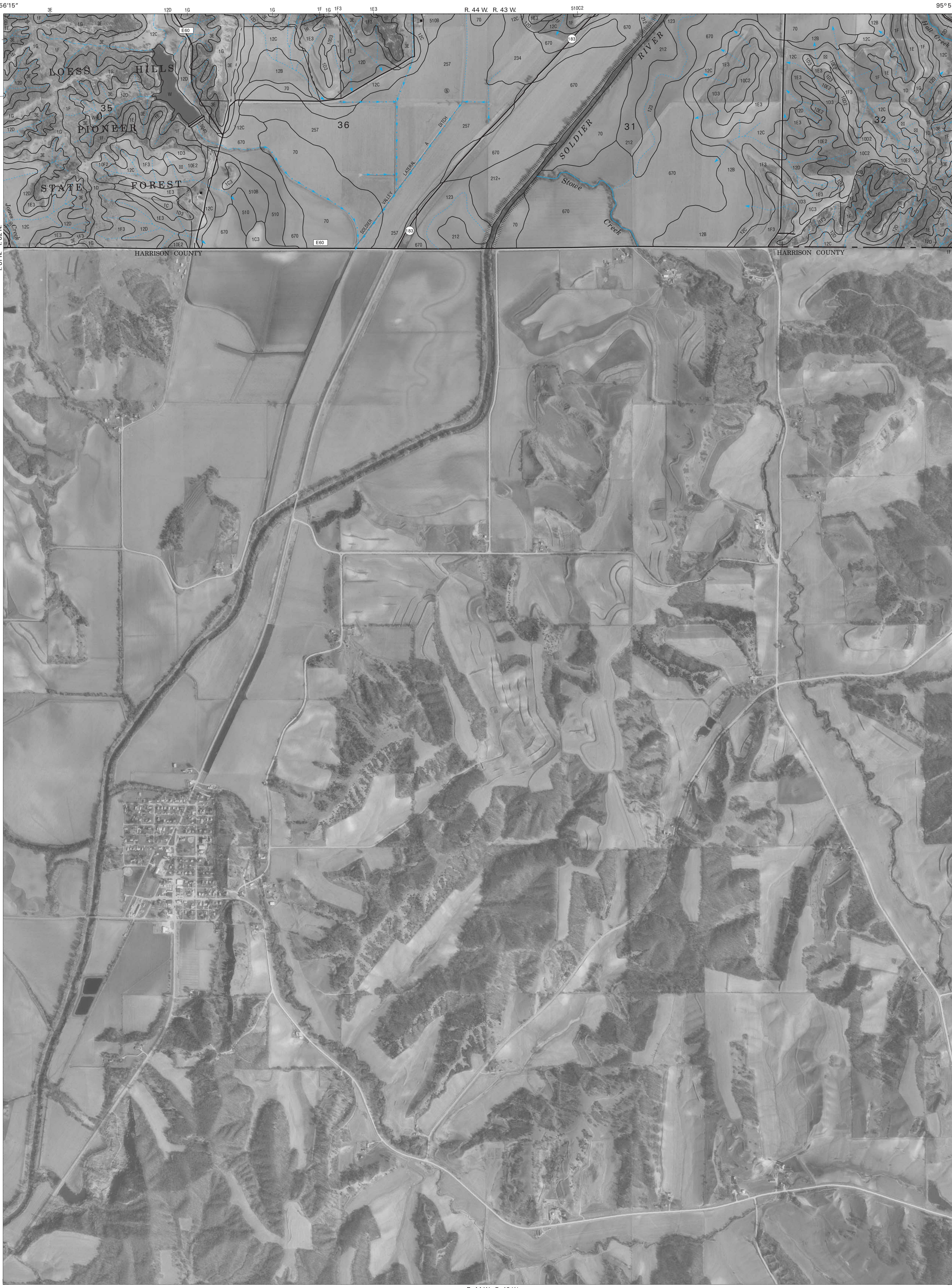
MONONA COUNTY, IOWA
PISGAH_NE QUADRANGLE
SHEET NUMBER 70 OF 74

(Joins sheet 61, Moorhead_NW_SE)

95° 56′15″ 41° 52′30″ — 95° 52′30″ 41° 52′30″

(Joins sheet 69, Pisgah_NW)

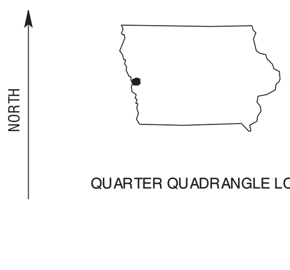


(Joins sheet 71, Moorhead_SE_NW)

41° 48′45″ 95° 56′15″ — R. 44 W. R. 43 W. — 41° 48′45″ 95° 52′30″

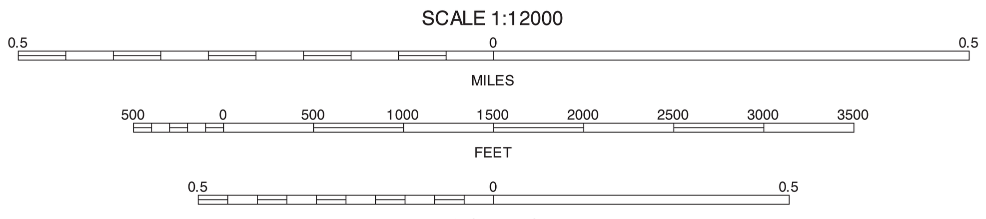
This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.



QUARTER QUADRANGLE LOCATION

SCALE 1:12000



1	2	3
4		5
6	7	8

1 MOORHEAD_NW_SW
2 MOORHEAD_NW_SE
3 MOORHEAD_SW
4 PISGAH_NW
5 MOORHEAD_SE_NW
6 PISGAH_SW
7 PISGAH_SE
8 MOORHEAD_SE_SW

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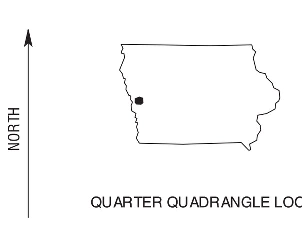
MOORHEAD_SE_NW QUADRANGLE
SHEET NUMBER 71 OF 74

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.



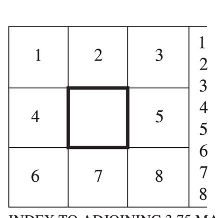
QUARTER QUADRANGLE LOCATION

SCALE 1:12000

0.5 0 0.5
MILES

500 0 500 1000 1500 2000 2500 3000 3500
FEET

0.5 0 0.5
KILOMETERS



1 MOORHEAD_NW_SE
2 MOORHEAD_SW
3 MOORHEAD_SE
4 PISGAH_NE
5 MOORHEAD_SE_NE
6 PISGAH_SE
7 MOORHEAD_SE_SW
8 MOORHEAD_SE_SE

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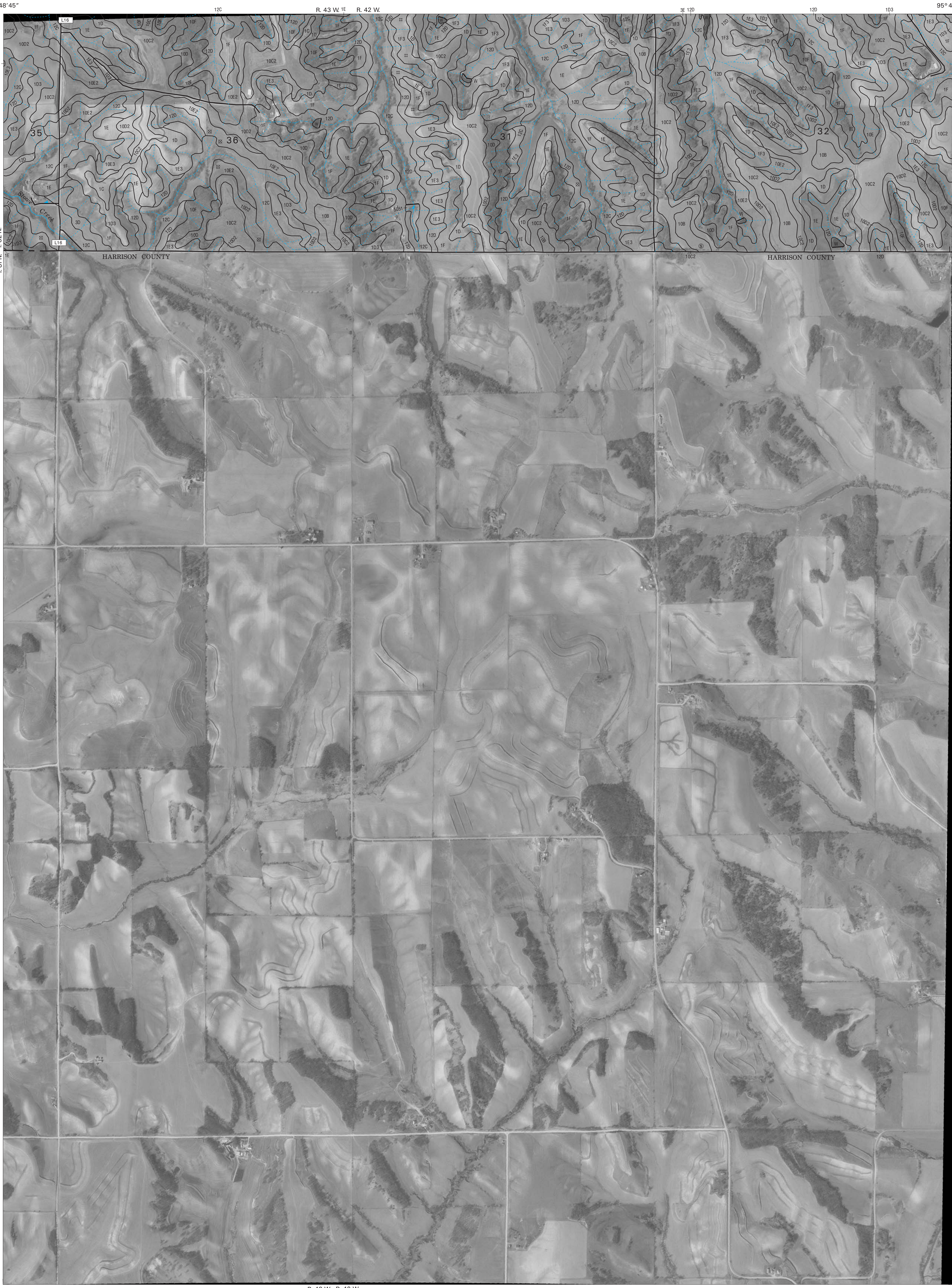
MONONA COUNTY, IOWA
MOORHEAD_SE_NE QUADRANGLE
SHEET NUMBER 72 OF 74

(Joins sheet 63, Moorhead_SE)

95° 48′45″ 41° 52′30″ R. 43 W. R. 42 W. 95° 45′00″ 41° 52′30″

(Joins sheet 71, Moorhead_SE_NW)

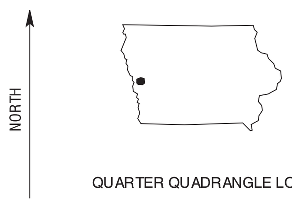


(Joins sheet 73, Dunlap_SW_NW)

41° 48′45″ 95° 48′45″ R. 43 W. R. 42 W. 41° 48′45″ 95° 45′00″

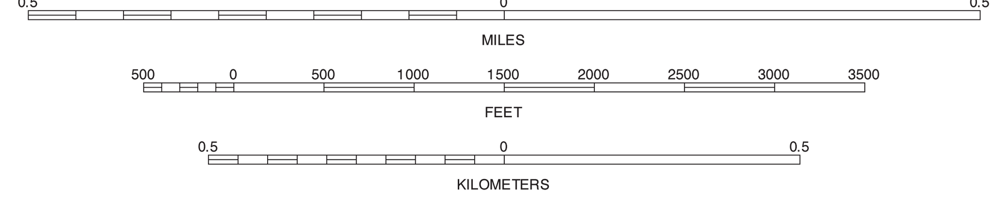
This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.



QUARTER QUADRANGLE LOCATION

SCALE 1:12000



1	2	3
4		5
6	7	8

1 MOORHEAD_SW
2 MOORHEAD_SE
3 DUNLAP_NW_SW
4 MOORHEAD_SE_NW
5 DUNLAP_SW_NW
6 MOORHEAD_SE_SW
7 MOORHEAD_SE_SE
8 DUNLAP_SW_SW

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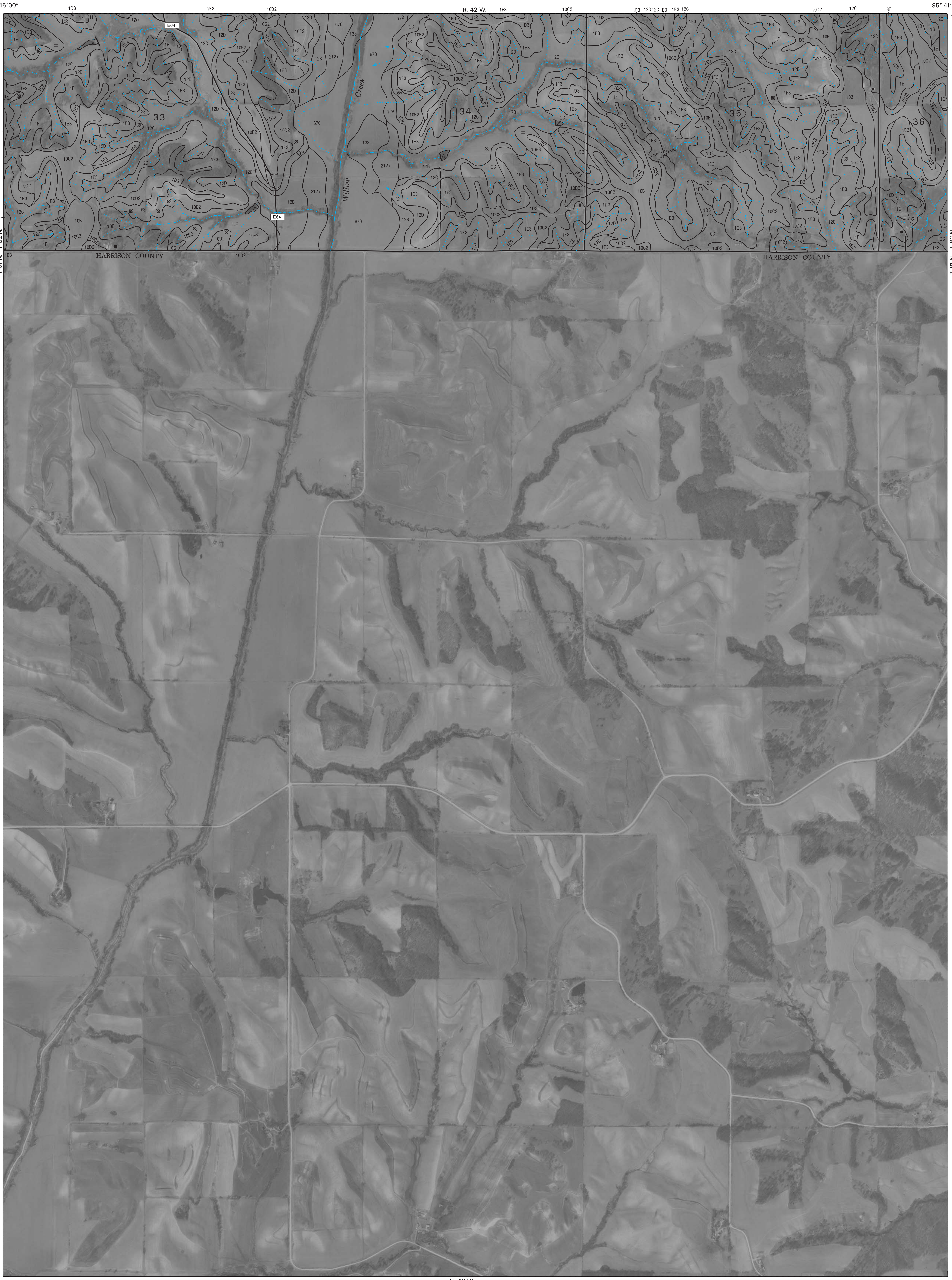
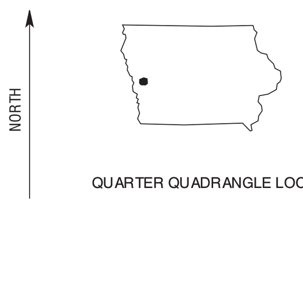
MONONA COUNTY, IOWA
DUNLAP_SW_NW QUADRANGLE
SHEET NUMBER 73 OF 74

(Joins sheet 64, Dunlap_NW_SW)



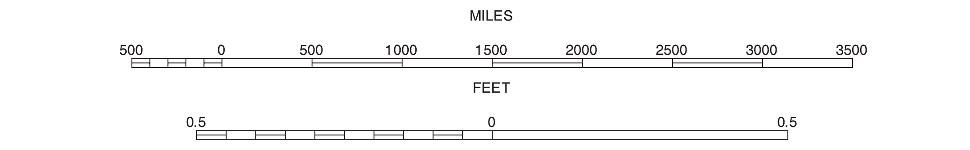
This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.



QUARTER QUADRANGLE LOCATION

SCALE 1:12000



1	2	3
4		5
6	7	8

1 MOORHEAD_SE
2 DUNLAP_NW_SW
3 DUNLAP_NW_SE
4 MOORHEAD_SE_NE
5 DUNLAP_SW_NE
6 MOORHEAD_SE_SE
7 DUNLAP_SW_SW
8 DUNLAP_SW_SE

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MONONA COUNTY, IOWA
DUNLAP_SW_NE QUADRANGLE
SHEET NUMBER 74 OF 74

(Joins sheet 65, Dunlap_NW_SE)

95° 41′15″ 41° 52′30″ R. 42 W. R. 41 W. 95° 37′30″ 41° 52′30″

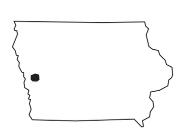
(Joins sheet 73, Dunlap_SW_NW)

41° 48′45″ 95° 41′15″ R. 42 W. R. 41 W. 41° 48′45″ 95° 37′30″

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1990 aerial photography. Public land survey system (PLSS) information and culture annotation were acquired from the U.S. Geological Survey. The hydrography layer was developed jointly in the soil mapping effort by field soil scientists. The cultural content and hydrography layer were edited to conform with features represented on the publication orthophotography and to enhance the clarity of the soils information.

North American Datum of 1983 (NAD83). GRS80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14 and zone 15. Coordinate grid ticks and land division data, if shown, are approximately positioned.

NORTH



QUARTER QUADRANGLE LOCATION

SCALE 1:12000

0.5 0 0.5
MILES

500 0 500 1000 1500 2000 2500 3000 3500
FEET

0.5 0 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 DUNLAP_NW_SW
2 DUNLAP_NW_SE
3 DUNLAP_NE_SW
4 DUNLAP_SW_NW
5 DUNLAP_NW
6 DUNLAP_SW_SW
7 DUNLAP_SW_SE
8 DUNLAP_SW

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